PRACTICAL
GUIDE TO PHOTOGRAPHY.

PRINTED BY
MAWSON, SWAN, & MORGAN,
NEWCASTLE-ON-TYNE.

PHOTOGRAPHY SIMPLIFIED:

A PRACTICAL TREATISE FOR THE USE OF AMATEURS OR PROFESSIONALS,

WITH USEFUL HINTS TO BEGINNERS

ON THE

SELECTION OF APPARATUS

AND ON GENERAL

PRACTICE,

TOGETHER WITH A SET OF LABELS FOR THE PHOTOGRAPHIC LABORATORY.

THIRD EDITION

CONSIDERABLY REVISED AND ENLARGED.

LONDON:

MAWSON & SWAN, 33, SOHO SQUARE.

SIMPKIN, MARSHALL, & Co., STATIONERS' HALL COURT.

NEWCASTLE-ON-TYNE:

MAWSON & SWAN, 11-15, MOSLEY STREET.

1887.

[*Entered at Stationers' Hall.*]

INTRODUCTION.

FEW more fascinating pursuits exist for the amateur of artistic tastes than photography; and certainly no phase of art is so readily accessible to the purses as well as the capacities of all. But, notwithstanding the facilities which modern photographic science has placed in the way of the aspirant to art, it is a mistake to imagine that the mere manipulation of certain apparatus and chemicals will ensure *artistic* success. True a due amount of attention paid to working instructions given, and a fair degree of care and intelligence devoted to the various manipulations will result in the production of a technically excellent *photograph*; but no amount of mechanical skill, nor of slavish obedience to instructions, will make up for the want of that *artistic* feeling which is so requisite to the creation of a picture.

In all cases where the intending beginner can command the advice of a friend who has successfully passed over the ground he is himself about to travel, by all means let him avail himself of it. Who better than an amateur can define the requirements and the difficulties of an amateur? and who more likely than a friend to give valuable and disinterested counsel? But, unhappily, many would-be amateurs are not fortunate enough to number on their list of friends one who has already acquired the necessary experience to advise them.

It is with a view of tendering such advice, as will be useful to the intending amateur in the selection of his outfit and in his early trials, that the following pages are written; after a careful perusal of the earlier chapters especially, he will be in a position to define his requirements exactly, to select just such apparatus as will be likely to suit him, and in purchasing second-hand or a "complete set" to judge of the value of the goods offered him. The chapters devoted to the chemical portion of the manipulations will be found to usefully supplement the instructions issued by the manufacturers and dealers in photographic goods, while, throughout, the endeavour has been to place the directions in the plainest and most intelligible terms.

CONTENTS.

PART I.

APPARATUS.

PART II.

THE NEGATIVE.

PART III.

THE PRINT.

PART IV.

MISCELLANEOUS.

PART V.

HINTS ON PRACTICE.

PART I.

APPARATUS.

Hints on Selection.—The first question to be considered before proceeding to the choice of apparatus is the kind of work required to be performed, as upon that will depend, in a very important manner, the class of apparatus requisite, more especially in the optical department.

The ordinary work likely to be undertaken by an amateur may be divided into two principal classes of a tolerably comprehensive nature, namely, landscape and portraiture, each of which necessitates apparatus of a more or less distinct form of construction. That is to say, in order to obtain the highest quality of result in either class, and at the same time to secure the maximum of convenience, instruments specially constructed for the particular purpose should be employed, though, as will be shown, it is possible, without much loss of quality, to perform both classes of work with the same set of apparatus.

Under the head of landscape work will be included, for the purposes of classification, landscapes pure and simple, marine and architectural subjects and interiors; while portraiture will cover, in addition to single portraits, groups, figure and animal studies. The special requirements of copying, enlarging and similar branches of the

art will be considered under their separate headings. Instantaneous work may belong to either of the two principal classes, but does not need any special remark beyond what will be said in connection with lenses and their use.

The chief points in which the two classes of work differ in their requirements may be briefly summed up. In landscape work, lenses are required which give a considerable amount of what has been called "depth of focus," that is to say, they must define with tolerable sharpness, objects placed at widely different distances from the camera. The possession of this quality depends in a great measure upon the employment of a narrow pencil of rays, or in other words a large portion of the lens is covered by means of a plate of blackened brass having a small aperture in the centre (and called a "diaphragm" or "stop,") so that only the rays passing through the centre of the lens are employed in forming the image. By thus covering up the greater portion of the surface of the lens, while the definition is improved generally, a large amount of light which would otherwise pass through it is arrested, and does not reach the sensitive plate; consequently, in proportion as the lens is "stopped down" to improve its defining power, so will it become slower in action. As a necessary corollary the best lenses for landscape purposes are comparatively slow, a matter of minor importance when it is considered that the chief features of such subjects are stationary.

In the case of portraits and pictures of animate objects, however, the requirements are different, and speed, or rapidity of action, becomes all important; fortunately in such subjects other circumstances combine to favour the employment of more rapid lenses. Thus in a portrait,

a group, or a figure study, the principal objects are chiefly in one plane, or nearly so, and, consequently, there is less necessity for depth of focus or the use of the diaphragm. Portrait lenses are therefore constructed for the special purpose of giving good definition on a single plane with a very large aperture, but their construction unfits them for use in landscape work unless an extremely small diaphragm be employed. The result even then is unsatisfactory, as compared with the work of a properly constructed landscape lens, and as the cost of the latter is much smaller, the portrait lens finds little use except for its own special purpose.

Between the landscape lens proper and the portrait lens there exist a class of instruments, which, while not possessing the high rapidity of the latter, approach far more closely to it than does the ordinary landscape lens, and which have the additional advantage of giving perfect definition, and exhibiting great depth of focus when stopped down. These lenses, to which has been given the name "aplanatic" (from the fact of their being corrected for spherical as well as chromatic aberration), may be employed with the full aperture, *i.e.*, without any diaphragm, in which condition they form excellent portrait and group lenses; while used in combination with a suitable diaphragm they equal the ordinary landscape instrument in result.

But there is one other quality which is requisite in a lens for architectural or copying purposes, viz.: *rectilinearity*, or the power of rendering straight lines. With the ordinary landscape or the portrait lens this power does not exist, all straight lines, except those which pass through the point at which the axis of the lens strikes the plane of the picture, being more or less curved in propor-

tion as they recede from that point. It results from this, that if such lenses be employed for architectural purposes, all right lines, whether horizontal or vertical, which fall near the edges of the picture are distorted into curves, utterly destroying the beauty of the picture. Lenses for architectural or copying purposes should therefore be chosen of the "symmetrical" or "rectilinear" type, these being doublet lenses, in which the back and front combinations being similar, but with their surfaces reversed in the mount, the distortion produced by one is neutralised by the other, and so rectilinearity is restored. The special properties of different forms of lenses will be pointed out as each individual type is described.

In cameras the main difference between portrait and landscape instruments lies in the matter of portability and convenience, there being no technical objection to the employment of the same camera for the double purpose. For portrait work only, in the studio or at home, under which circumstances there is no particular necessity for portability or lightness, as the camera has not to be transported from place to place, a simple form of instrument suffices for all purposes, at least, so far as the taking of heads and busts is concerned. Such a one is the plain "sliding body" camera, now almost out of date, consisting of a solid wooden framework, with, as its name implies, an inner body which slides for the purpose of focussing. The sliding wooden body is, however, now almost universally displaced by the "bellows" body, which enables the bulk of the instrument to be reduced, while it gives a far greater range of focus.

For full-length figures, the addition of a "swing-back" is desirable; this is an arrangement by means of which the focussing screen can be thrown out of the perpendicular

position, which is useful, especially in taking sitting figures or groups, in bringing into focus certain parts of the subject which would not otherwise be sharply defined. A "rising front," which enables the lens to be raised or lowered, saves much trouble in altering the height of the camera, in centreing the picture on the plate. In the better classes of camera the focussing is performed either by screw or rack-work adjustment. The ordinary portrait camera for single pictures is usually made square, with an arrangement in the dark slide enabling the plate to be exposed, with its greater length, either in a vertical or horizontal direction; the first position being suitable for single portraits or small groups, the second being better adapted to groups comprising a large number of figures.

A better form of camera is constructed, which is capable of taking a single picture, or, by the aid of a "repeating back," two or more smaller pictures on the same size of plate. Thus the same camera may take a single cabinet or two carte de visites.

The landscape camera is a more elaborate piece of apparatus than that solely designed for portraiture. Not only must it be light and strong, but while folding into small compass when packed, it must possess a wide range of focus, so as to adapt it for use with lenses of every description, and under all manner of circumstances, and be firm and rigid when extended to its utmost. These conditions necessitate workmanship of the highest class, and considerable ingenuity in carrying out the various arrangements; consequently, a good landscape camera is a comparatively expensive instrument.

The requirements in a modern landscape camera of first quality are, in addition to strength, lightness and portability, range of focus and ready adjustment in setting

up or taking down. It must possess screw or rack-work focussing arrangement, "swing back," "double sliding front," and "reversing back," for altering the plate from the vertical to the horizontal position, without interfering with the camera.

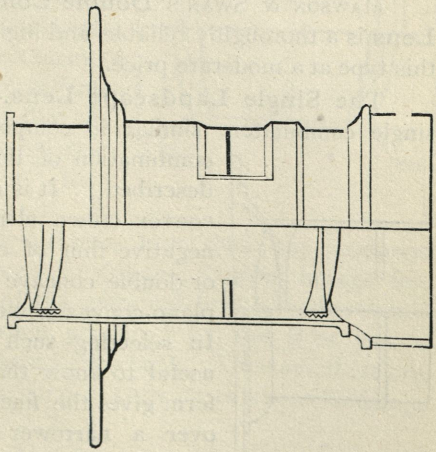
The use of the "swing back" in landscape and architectural work is of greater importance than in portraiture. In pure landscape, by swinging the back so as to throw the upper portion of the plate further away from the lens than the lower, a close foreground may be brought to focus simultaneously with the distance of a landscape; the side swing may be used in a similar manner when one side of the view, as in a street scene, is in closer proximity to the camera than the other. In architectural work the "swing back" is absolutely necessary; if, in photographing, say a church, it be needful to tilt the camera from its horizontal position, in order to bring the top of the spire on to the plate, it will be found that the perpendicular lines of the building have lost their uprightness, and lean towards the centre of the plate. To remedy this defect, the "swing back" is brought into play, and by its means the focussing screen or sensitive plate is placed in a perfectly vertical position, when the lines will resume their perpendicularity. When it is possible, it is preferable to use the rising front rather than tilt the camera; but whichever course be adopted, a small stop must be placed in the lens in order to secure definition.

Other items of apparatus will be described in the chapter devoted to the purpose, and require no special mention here.

In the two following chapters on *lenses and apparatus*, will be found described the best types, specially recommended by Mawson & Swan, the quality and style of which are guaranteed.

LENSES.

The Petzval Portrait Lens.—The Petzval form of portrait lens, worked out many years ago by Professor Petzval, of Vienna, is the one almost universally employed throughout the world. Its construction is shown in the figure, from which it will be seen to consist of two combinations: a front combination of two elements—a double convex crown and a plano-concave or double concave of flint, cemented; and a back combination of two uncemented elements—a double convex crown and a negative meniscus or concavo-convex flint, separated by a narrow ring of metal. This lens is aplanatic in its construction, that is to say, it is calculated to give the finest possible definition with its full aperture. It is, therefore, the most

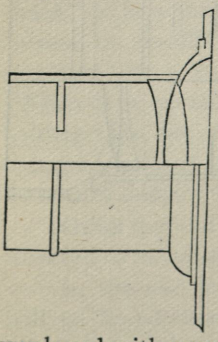


rapid form of lens in general use. But with its full aperture it will only define objects upon the same or nearly the same plane, and over a limited area or angle. For taking full length figures or groups it will, consequently, be found necessary to employ a stop or diaphragm, in order to secure definition up to the margin of the plate. For landscape work the back combination may be removed and the front lens inserted in its place, with its convex surface towards the focussing screen; a moderately small stop must be used under such circumstances.

These lenses are constructed with rack and pinion (not shown in the diagram) for focussing and "Waterhouse" diaphragms, detached plates of brass inserted between the lenses, in the slot shown on the upper side of the lens tube.

MAWSON & SWAN'S **Double Combination Portrait Lens** is a thoroughly reliable and high-class instrument of this type at a moderate price.

The Single Landscape Lens.—This consists of a single combinaton, similar in composition to the front combination of the portrait lens just described. It is made up of a double convex crown element cemented to a negative flint of either plano-concave or double concave (see fig.), forming a plano-convex or meniscus combination. In selecting such a lens it may be useful to know that the plano-convex form gives the finest definition though over a narrower area; while for covering a wide angle the meniscus employed with a smaller diaphragm is preferable.

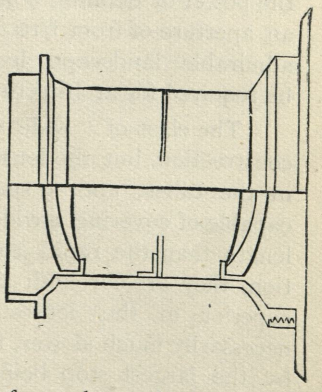


There are special forms of single lenses in the market

composed of three cemented elements. These will be found in their makers' lists in MAWSON & SWAN'S catalogue.

The ordinary single lens cannot be used without a diaphragm; the largest aperture with which it will work well is one of about one-sixteenth of its focal length, or f/16. Some of the lenses of special make are, however, more rapid, working with a much larger aperture.

Doublet, Rectilinear, and Symmetrical Lenses.—A great variety of lenses are known under the titles of doublet, rectilinear, or symmetrical, but most, if not all, of those in modern use are of the same type, viz., that known to opticians as "Steinheil's Aplanatic." This is shown in its general construction in the annexed figure, and consists of two similar combinations, composed in some instances of two flint elements of different density, in others of flint and crown. The two combinations being identical in form, or symmetrical, and the diaphragm placed equi-distant from them, the compound lens is what is termed "rectilinear," gives images free from the curvature of the marginal lines already referred to, since any distortion produced by the front lens is reversed and neutralised by the back. They are, therefore, invaluable for architectural or copying as well as landscape purposes.



From the fact that these lenses are aplanatic and work with full aperture, the rapid rectilinears make capital portrait and group lenses. Their average "angular

aperture" is about f/8; that is, they work with an aperture of one-eighth the focal length, and, though this is only one-fourth the rapidity of the ordinary Petzval portrait lens, it is sufficiently rapid to enable them to be used for portrait work where one lens is required to serve all purposes. In fact, for general purposes, there is no better "all round" lens than one of the rapid rectilinear form. When employed for landscape work they must be used with a comparatively small stop, otherwise they will be wanting in the quality known as "depth of focus," or the power of defining objects at different distances. With an aperture of from f/16 to f/22 they will be found to make admirable landscape lenses, though a smaller stop will be required for architecture.

The class of "wide angle" rectilinears are similar in construction, but the lenses being mounted closer together in the tubes, and a smaller stop being used, they are capable of covering a wider area in proportion to their focal length than the rapid series. Though, as regards definition, they are for both landscape and architectural work superior to the lenses already spoken of, they are necessarily much slower, their average aperture measured by the largest stop being about f/16, or one-fourth the rapidity of the rapid series.

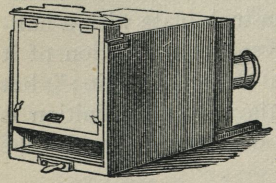
In speaking of the angle a lens will cover, it must be taken in connection with the size of the plate upon which it is to be used. The calculation is, in fact, one between the focal length of the lens and the dimensions of the plate. For instance, a lens of six inches focal length would be a "wide angle" if employed on a plate of ten inches, a "medium angle" on a six-inch plate, and a "narrow angle" on one of four inches. This explanation is necessary owing to a misapprehension that exists that

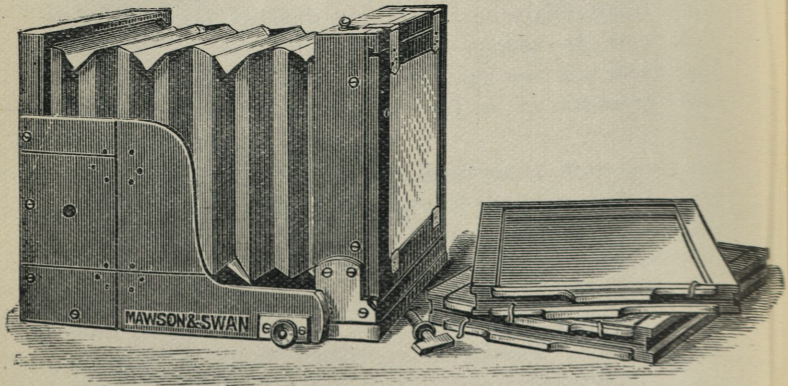
the angle a lens will include on a given size of plate may be altered by changing the diaphragm. This arises from certain opticians advertising lenses as being wide, medium, or narrow angle, according to the stop employed, and this they do inasmuch as they *give definition* over a wider area with a small stop. But if the six-inch lens will include a certain amount of subject upon a four-inch plate with a half-inch stop, it will include no more if a stop of an eighth-of-an-inch be used, though the definition will be finer. Or if it be used upon a ten-inch plate with a half-inch stop it will only cover a very small portion of it sharply, and therefore it is but a "narrow angle;" but if a much smaller stop be used the area of definition is extended, and it then becomes a wide angle lens for the plate it covers.

In selecting from the numerous lenses of these types by various makers, it will be useful to bear these few remarks in mind, and there will then be little chance of choosing an unsuitable instrument.

CAMERAS.

The Portrait Camera.—The simplest form of portrait camera is, as has been said, the primitive "sliding body" camera, consisting of two wooden bodies, one sliding within the other. The instrument is at the best a clumsy specimen of apparatus, usually bulky, out of all proportion to the size of the picture it is intended to take, and in its simplest form devoid of all but the barest necessities in the shape of facilities for picture making. Still, where economy is an object and portraiture alone the task, it will perform its work as well as a more elaborate instrument.

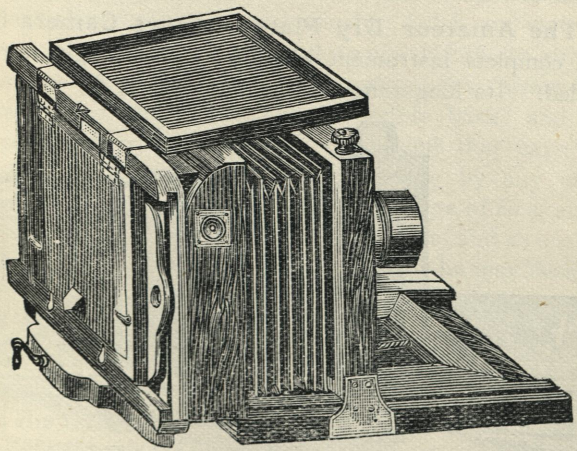




The substitution of extending-leather bellows for the

wooden body brings about a great improvement, lessening the weight and bulk of the camera, while its range of focus is greatly increased. The addition of the screw focussing adjustment, a simple form of swing-back, and an arrangement for taking the picture in either the vertical or horizontal position, form a really efficient camera at a moderate cost. If the base board be hinged, so as to allow the camera to fold up, we have an instrument that may be used for either portrait or landscape work. Such a camera is shown in the figure on preceding page.

A still more perfect camera and one fitted for the production of the highest class of portraiture is the *Improved Studio Camera*, shown below. This is fitted with screw adjustment for focussing, hinged focussing screen, swing back and double action sliding front, and

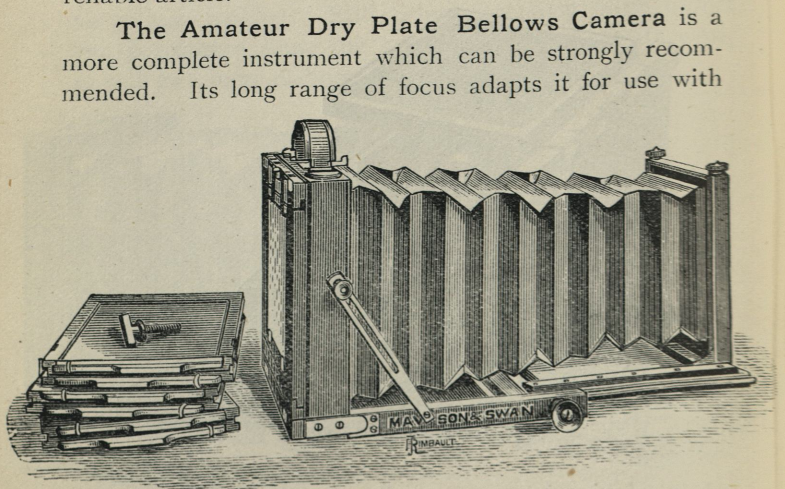


while packing into very small space, so as to be available for use with lenses of the shortest focus, its bellows

extension permits the employment of the longest focus required for cabinet heads and other pictures. The back is made square so that single pictures may be taken either in the vertical or horizontal direction. It is also fitted with a repeating back enabling two or more pictures to be taken upon the plate.

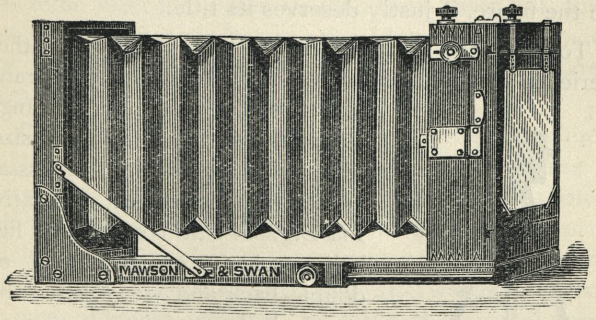
Landscape Cameras.—The simplest form of landscape camera, and one which is at the same time thoroughly efficient is that shown on page 12, and if this be fitted with reversible back, instead of the hinged sideboard for reversing the camera itself, it forms as complete an instrument as the beginner who is economically inclined can wish to use. Thoroughly efficient for its purpose, whether portrait or landscape, and well-made of seasoned material, it can be recommended as a good and reliable article.

The Amateur Dry Plate Bellows Camera is a more complete instrument which can be strongly recommended. Its long range of focus adapts it for use with



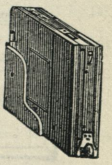
lenses of any class, and for all kinds of work. It is fitted

with swing back, sliding front, rack adjustment for focussing, reversing back, and folds into a very compact form for travelling.



MAWSON & SWAN'S **Improved Portable Dry Plate Camera** is a specially constructed instrument of the very highest class, both as to workmanship, finish, and style. It is specially made in light and compact form to suit the tourist-amateur; is fitted with swing-back, swing-front, rising and falling front, and reversible back; and with three double slides, forms an equipment that cannot be excelled for completeness and efficiency by any in the market. It has an exceedingly wide range of focal adjustment, adapting it for lenses of every focus, and so enabling the amateur to execute any class of work he may desire.

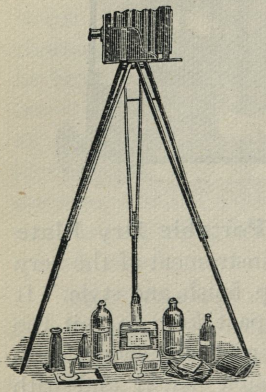
The above cameras are made in all the usual sizes, but for those who are content with a small picture, from which subsequent enlargements can be made, if desired, the *Improved Pocket Camera* will prove just the thing. This camera is of the very best construction, fitted with vertical and horizontal sliding fronts, rack adjustment for focussing, and arrangements for reversing. It can be



CLOSED.

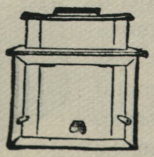
supplied with or without swing-back, some operators preferring to dispense with that attachment, where portability is a consideration. When packed for travelling, as in the figure, it justly deserves its title.

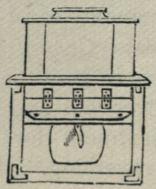
To meet the convenience of those who are without experience in connection with photographic apparatus, MAWSON & SWAN have arranged complete sets in all the usual sizes, comprising everything necesssary in the production of a negative. *The Beginner's Set* consists of a light bellows body camera, with one double back and view lens, tripod stand, instantaneous shutter and focussing cloth, together with all the requisites for development, and a supply of sensitives plates.

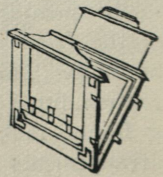


A fuller set, the apparatus of the very highest class of construction is supplied in the "Paragon" set, which will be found specially useful to engineers, architects, surveyors, builders and others.

Dark Slides.—At least one dark back or slide is included in the price of every camera. The ordinary complement for a studio camera is one back, though it is convenient to have more, while three or sometimes six







double backs, to carry half-a-dozen or a dozen plates usually go with a landscape outfit. For studio work the slides are sometimes fitted with inner frames or adapters to enable them to be used for plates smaller than their full dimensions; but these inner frames are seldom employed by out-door workers, and require to be used with great care as they are necessarily very thin and weak.

Changing Boxes.—Instead of carrying a number of double slides, some out-door workers prefer to use the *Changing Box*, of which there are several forms known. This is a grooved box, carrying a dozen or more plates, which are, by a mechanical arrangement, transferred singly to the dark slide for exposure, and afterwards returned to the box. Though preferred by some, the general opinion is that they are inferior in convenience to double slides.

Roll Holders for Paper Negatives.—The recent reintroduction of paper as a support for negative pictures has brought into the market a number of *Roller Slides* or *Roll Holders*. These are dark slides arranged to carry a roll of sensitive paper, sufficient for a number of exposures, the paper after each exposure being wound off from one roller to another without opening the case. The arrangement is of the greatest convenience to the regular employers of paper in place of glass.

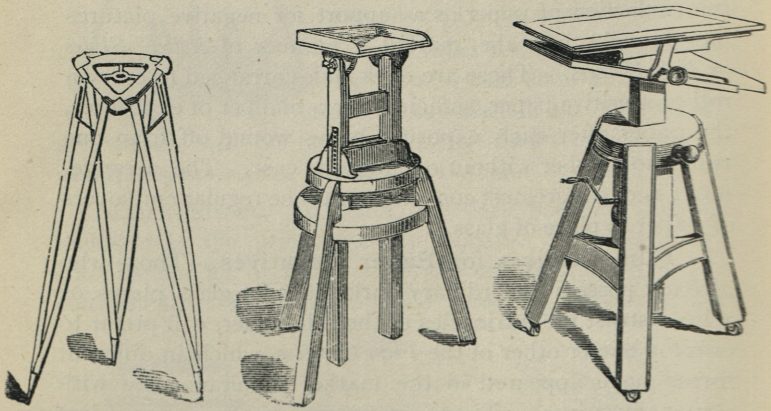
Film Carriers for Paper Negatives.—Those who already possess the ordinary dark slides for glass plates, or who distrust the intricacies of the roll holder, will prefer to employ one or other of the *Film Carriers*, which in different forms have appeared in the market simultaneously with paper negatives. These are arrangements more or less simple for holding cut sheets of sensitive paper flat, for the purpose of exposure in the ordinary dark slides; and, as they require none of the care and calculation that must be

expended on the roll holders, they are likely to secure, at least as much favour as the more intricate instrument, if paper should take the hold upon popular fancy that some people imagine it will.

The three last mentioned articles can be supplied with MAWSON AND SWAN'S cameras, if desired.

Camera Stands.—The next important item in the list of apparatus is the camera stand, which is made in a variety of forms too numerous to mention individually.

The simplest form for portrait work is the plain tripod stand, with triangular top of wood or metal, shown in fig. ; but much better adapted to the purpose is the adjustable *Table Stand*, also shown in two forms below. For the amateur, however, who does but occasional portrait work, the ordinary tripod will answer every purpose.



For landscape purposes, as with cameras, we have to study portability; accordingly the most common form of out-door stand consists of a light tripod, constructed to

fold in the centre of each leg, so as to bring it within moderate dimensions for carrying.

Kennett's Screwless Stand is made upon a different principle; the legs, instead of folding, being constructed in three pieces, which slide telescopically, being clamped firmly in position, at any height, by means of a sliding band of brass. This is a very convenient arrangement, as it permits the legs to be adjusted at different heights to suit very uneven ground. It also gives great range in the available height of the stand, which may be raised from four to nearly six feet.

Mawdsley's Pattern is another very convenient form of stand, being light and rigid, and readily adjustable to any height or inequalities in the ground. It combines the folding and sliding principles, but is less liable to work stiff, through moisture, than Kennett's.

Instantaneous Shutters.—Probably in no department of photographic mechanics has more ingenuity been displayed—much of it perhaps misdirected—than in the construction of instantaneous shutters. It is impossible to mention one tithe of the devices that have secured public recognition, while to enumerate all that have struggled unsuccessfully for existence, would require a goodly volume. Despite the highly ingenious, and in some cases, really beautiful mechanical contrivances that have been brought out, there is perhaps no better form for ordinary work than the simple "drop" shutter, with an elastic band to quicken it when needful. Kershaw's shutter is a very good pattern, and one much in demand. It is light, compact, and simple to use, and allows considerable range in speed. Another good and simple shutter is Reynolds and Branson's *Combined Drop and Flap*, in which the opening movement is made by a rising

flap, and the closing by a drop; or, if preferred, the drop alone can be used.

The Focussing Cloth.—This humble but important adjunct to the travelling photographer's kit very often consists of a square of black cotton velvet, not less than a yard and a half in dimensions. This is a very suitable material, and if a small bag of shot be sewn into each corner, to prevent it being blown about by the wind, it will prove very convenient.

A more useful material, however, is found in black waterproof cloth, which can be purchased in widths up to a yard and a half. In case of sudden rain, the focussing cloth acts as a protection to the camera.

It is a great mistake to curtail the size of the focussing cloth.

The Camera Case.—This is usually constructed of solid leather, with separate partitions for the slides and lenses, and sling strap to carry it over the shoulder. A cheap and efficient substitute for leather, and one which, if less durable, is considerably lighter, is found in waterproof mail cloth. This, however, is a matter in which the taste and purse of the amateur must be consulted.

PART II.

THE NEGATIVE.

The Wet Collodion Process for Iron Development.—For a period of twenty years or more the Collodion process was universally employed, being generally styled "The Wet Process."

To secure success in photography, three things are primarily necessary—pure chemicals, trustworthy formulæ, and good manipulation. Presuming that the Photographer will purchase the first, we will now detail the second, and describe the third, adding also a few general suggestions and precautions.

CHEMICALS.

The Collodion, to which the following formulæ and directions more particularly apply, is *Mawson's Negative Collodion for Iron Development.* Of all the collodions for iron development, MAWSON'S is the oldest, best known, and most largely used in the world, and its many peculiarly excellent qualities have, through a long series of years, obtained for it a constantly increasing popularity. It is extremely sensitive, stable, and uniform in quality; gives a strong, smooth film, and readily yields negatives combining brilliancy with delicacy of gradation. Another advantage of this collodion is the ease and certainty

with which, by means of it, every quality that it may be desired the negative should possess can be obtained. The film it produces is adhesive, strong, and structureless. The image obtained by a single application of the developer is so vigorous as generally to require little or no further intensification. Half-tone, in any required degree, is readily procurable with it; but as will be afterwards explained, the production of half-tone depends almost entirely upon exposure and development. The collodion has, moreover, very remarkable keeping properties, even in the hottest climates.

The collodion should be iodised at least one day before it is required for use. It will keep in good working condition during several months. Negatives taken with collodion that has been iodised a month are cleaner and more brilliant than those taken with more freshly-iodised collodion, and the sensitiveness is very slightly less. The proportion of iodiser to be added to the collodion is one part of the iodiser to three parts of the plain collodion, and this proportion should be accurately measured.

The collodion should be kept for use in a collodion-pourer, with a glass cap instead of a stopper; or if this form of bottle be not used, the neck of the bottle should be carefully freed from dried pieces of collodion before coating a plate. As each time a plate is coated, portions of dust, &c., are carried back into the bottle with the surplus collodion, it is desirable, after about half the contents of the pourer has been used, to empty the residue into a large bottle kept for the reception of residues, and to replenish the pourer with a fresh portion of carefully decanted and pure collodion from the stock bottle. When the bottle of residues is full, it should be left at rest for a few days, that the impurities may subside;

the clear portion, to the extent—say of half, may then be decanted into a bottle for use. If the collodion becomes too thick for evaporation, it may be slightly diluted with a mixture of one part alcohol and two parts æther; but especial care should be taken that the æther and alcohol are pure.

The Nitrate Bath.—Theoretically, a neutral bath is best; but as it demands the utmost purity in everything used, the most perfect conditions in all respects, and the most complete skill, a bath with a slightly acid reaction, is generally preferable. With some sample of collodion, and a pyrogallic developer, the slightest trace of free nitric acid in a bath is fatal to sensitiveness; whereas, with an iron developer and this collodion, the nitrate bath may contain a sufficiently decided trace of free acid to ensure clean working without serious detriment to sensitiveness. But great *excess* of acid will, of course, necessitate an increased exposure, and sometimes cause loss of both half-tone and brilliancy. The following formulæ is recommended:—

Nitrate of Silver	...	...	1 oz.
Distilled Water	...	...	14 oz.
Iodide of Potassium	...	...	½ gr.
Strong Nitric Acid	...	...	1 drop.

First dissolve the iodide in the water, and then add the nitrate of silver; shake well and filter. A bath so made will generally, after filtration, work well at once; but if, from some impurity in the water, or in the nitrate of silver, the bath be found to give fog or streaks, it will be well to proceed as follows: Take a 10-grain solution of caustic potassa, and add it, drop by drop, to the bath (shaking after each addition) until a very slight turbidity is produced; then place the solution in the sun for a few

hours, after which filter out the blackened precipitate. A few drops (say 10 to the pint of bath) of dilute nitric acid (consisting of 1 part of nitric acid as to 10 parts of water) may now be added. After making this addition, the bath should be set aside for a few hours, and then tested in the following manner:—Coat and excite a plate, and after taking it from the bath, drain it well; then, instead of exposing it to the camera, omit the pressure, and at once apply the developer as if the plate had been exposed; allow this to act as long as is usual in developing a picture, then wash off with water, and clear with cyanide or hypo-sulphite solution. If sufficient acid has been introduced, there will be no deposit whatever on the plate; it will appear like bare glass. If there be a slight loose deposit, which may be removed with the finger, the addition of a little more acid will probably remedy this defect. But it is desirable that no more acid should be added than is absolutely necessary to procure a clean plate, and hence it is better to add a very few drops at a time, and to try a plate after each addition, than to introduce it in larger quantities, with the risk of overdoing it. In testing the bath as described, it is imperative to use a perfectly clean plate, to have the operating-room quite free from actinic light, and to employ a developing solution that is known to be in good condition; otherwise this test is useless, and will only lead to a false conclusion.

The Developing Solution may be varied according to circumstances, but the following will be found to give good results for general purposes:

Protosulphate of Iron	½ oz.
Glacial Acetic Acid	¼ oz.
Spirit of Wine	¼ oz.
Loaf Sugar	1 oz.
Water	10 oz.

Or the following:

No. 1.

Protosulphate of Iron	½ oz.
Sulphate of Copper	½ drachm.
Water	5 oz.

No. 2.

Nitrate of Baryta	½ drachm.
Glacial Acetic Acid	¼ oz.
Spirit of Wine	½ oz.
Water	5 oz.

Dissolve No. 1 and No. 2 in separate bottles, then mix and filter.

As spirits of wine plays no part in the operation of development, but is only used to make the developing solution run freely over the plate, and mingle without repulsion with the silver solution which is on the plate, the proportion may be varied to suit different circumstances, the rule being this—an old bath, having become highly charged with æther and alcohol in the developer to make it flow freely; a new bath will require very little alcohol to make it flow without difficulty. Either of the above formulæ will be found adapted for general purposes; they may, however, be considerably varied in strength and other respects, without materially affecting the quality of the picture produced. Those who have some favourite developing mixture of their own, in the use of which they are practised and skilful, may adhere to their accustomed formula, probably without any disadvantage. Mixtures made according to the above formulæ *work best when a few days old*, but they continue good for a very considerable period.

It may be desirable here to mention how the strength of the developing solution affects the character of the

picture. It will generally be found that a weak developer gives the *densest* negative, and a strong one the *most harmonious* negative. The reason appears to be this:—With a weak solution the development is more gradual; the high lights appear first, and the reduced silver first begins to deposit there, and, from a tendency to aggregation, continues to deposit there in greater proportion than elsewhere. Hence a slowly-developed negative generally presents greater contrast of light and shade than a negative which flashes out in all parts with equal rigidity, from the application of a strong developing solution. As a weak developer requires keeping on the plate a long time to do its office, it needs a larger proportion of acetic acid to prevent fogging or reduction on the shadows, than when the development is completed in a few seconds. On the other hand, when a strong solution is used, a very small proportion of acid is necessary for completing the development with a strong developer. A strong developer gives harmonious negatives with *shorter exposure* than a weak developer; but the stronger developer requires greater care in manipulating, to avoid stains, greater care to avoid white light in the camera or dark room, and greater care as to the condition of the nitrate bath. Where the time of exposure is not an object, perhaps the greatest brilliancy and cleanliness, combined with delicacy, can be secured with a weak developer, containing a large proportion of acetic acid. For well lighted subjects, in summer, the following proportions give very fine results:—

Protosulphate of Iron	¼ oz.
Glacial Acetic Acid	¼ oz.
Water	10 oz.
Sugar	1 oz.
Spirit of Wine	¼ oz.

The sulphate of iron should be quite pure and free from dust. The proper colour of the crystals of the sulphate of iron is a bluish green. The double sulphate of iron and ammonia, which is a more stable salt, and preferred by some as a developing agent, is of a still paler colour. This may be substituted, perhaps with some slight advantage, for the sulphate. If this be used, the quantity should be one-half more than that of the sulphate in the formulæ.

Intensifying Solutions.—As it frequently happens that the negatives do not acquire sufficient intensity with a single application of the developing solution, re-development or intensifying is sometimes necessary. This may be accomplished either with a solution of pyrogallic acid, or a pro-salt of iron, with the addition of citric acid and nitrate of silver, as follows :—

THE RE-DEVELOPING SOLUTIONS.

No. 1.

Nitrate of Silver	10 gr.
Distilled Water	2 oz.

No. 2.

Citric Acid	25 gr.
Pyrogallic Acid	10 gr.
Distilled Water	2 oz.

No. 3.

Protosulphate of Iron...	10 gr.
Citric Acid	10 gr.
Distilled Water	2 oz.

No. 2 should be made fresh, as it does not keep more than a few days. Nos. 1 and 3 keep indefinitely. At the moment of using, a mixture is to be made up of either

equal parts of Nos. 1 and 2, or of No. 3, with a few drops of No. 1 added.

CLEARING SOLUTIONS.

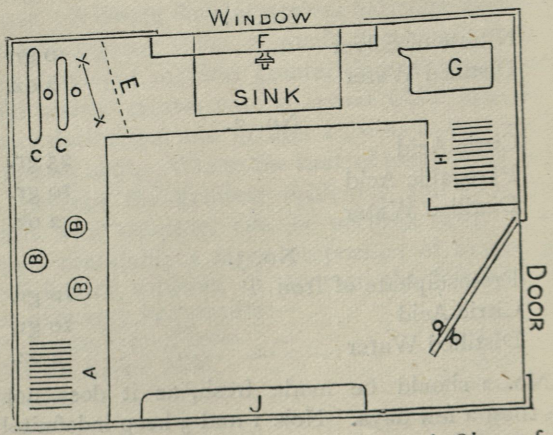
Hyposulphite of Soda	1 oz.
Water	4 oz.

OR

Cyanide of Potassium	¼ oz.
Water	10 oz.

The cyanide solution is the more convenient; but as it is very energetic in its action, it requires to be used with care to avoid loss of half-tone. The hyposulphite acts less on the image, and reduces the intensity of the negative less; but it is much more troublesome, and less cleanly than the cyanide solution. If the cyanide solution is employed, the greatest care must be used to guard against accident, as it is a most deadly poison.

The Dark Room.—The first essential, not only to



comfort of working, but also to the production of good

work, is a well arranged and properly appointed dark room. The size is immaterial, as a great amount of space is not needed if method is observed in its utilisation. The annexed diagram and description will give a fair idea of what is necessary; it represents a room measuring eight feet by six, but any other dimensions will answer.

A Rack for Clean Plates.
B B B Collodion Bottles, plate holders, &c.
C Sensitising Baths.
D Draining Rack.
E Partition, fixed or movable.
F Shelf for Developing Bottles.
G Fixing Bath.
H Drying Rack for Negatives.
J Range of Shelves.

Description.—A broad shelf, eighteen or twenty inches wide extends round two sides of the room, and part of the third at such a distance from the ground as to serve for a work bench. The window is in the centre of one of the longer sides, and immediately below it a lead-lined sink is let into the work bench. The door is in one of the shorter sides of the room, but if more bench space is required it can be placed in the side opposite the window. The window may be about two feet square, and should reach to within a few inches of the bench. The developing sink which reaches right back to the wall may be eighteen inches square by eight or ten deep—the deeper the better to prevent splashing. It is provided with a tap to which a short length of rubber tubing is attached.

Commencing from the left hand corner at **A** it will be observed that a certain method is observed in the arrangements, and this should be strictly adhered to in order

to ensure uniformly clean work. **A** is a rack for clean plates (which should be cleaned and dusted before being brought into the dark room.) Close by stand **B B B**, the collodion bottles, and pneumatic holder, and this portion of the bench should be devoted solely to coating the plates. A camel hair dusting brush should occupy a place within reach of the hand. **C C** are the sensitising baths, one being kept for large, the other for small plates; these may, with advantage, be let in flush with the bench and each covered with a wooden cover. **D** is a rack upon which the plate is allowed to drain for an interval before placing it on the slide. The slide should have its place, when not in use, in a rack under this portion of the bench. **E** is a screen, which may be either fixed or movable, to prevent the direct light from the window falling on the plate while sensitising and draining. **F** is a narrow shelf upon which the developing bottles and vessels stand ready to hand. **G** is a porcelain dish for the fixing solution, and **H** a drying rack into which the negative is placed when finished.

It will be noticed that the various operations proceed regularly, from left to right, round the room; each stage of the process is thus kept separate, and all danger of the baths becoming contaminated with other chemicals avoided.

It is a good plan to keep the dark room as free from unnecessary shelves as possible, as they only harbour dust; but if it is unavoidable, a range of shelves may be fixed at **J**. Suitable means should be adopted to secure ventilation without the admission of light.

The only additional suggestions necessary to make under this head, relate to the importance of excluding the plate from any trace of diffused light. The utmost

care should be used not only to prevent light entering the dark room through chinks of the door, &c., but also to ascertain that the yellow glass, or other material forming the dark room window, transmits no actinic light. This is important in all cases; but in the use of MAWSON'S collodion, this precaution is more than ever imperative, as, from its extreme sensitiveness, it is very liable to injury from feeble rays of light. If any trace of actinic light be present in the dark room, it is impossible to obtain brilliant negatives, as that light is acting on the plate as soon as it is removed from the bath for the purpose of being placed in the dark slide, and again during the time of development. This will cause a deposit on the deep shadows, which should present points of bare glass, and any deposit on those points is fatal to brilliancy. If daylight is admitted to the operating room through a pane of yellow glass, this glass should be of the deepest orange colour—almost red. Two thicknesses should be used if the colour is not very deep. The size of the pane should be no larger than is absolutely necessary.

The Camera.—Equal care must be used to exclude diffused light from the camera. For this purpose a large piece of black calico should be thrown over the camera and dark slide, the back, or any other part. The cloth should be over the camera whilst the shutter of the dark slide is raised, the hand being put under the cloth to raise it; however perfectly made the dark slide may be, this precaution ought never to be neglected. The whole of the inside of the camera must be quite black, and it is important that the lens should be so sheltered that no light can pass through it except from the object forming the picture. In taking portraits, it is very advantageous to shade the lens by means of a long box or tube of wood or card, lined

with black velvet, and placed in front of the lens in such a manner as to prevent unnecessarily oblique rays of light from entering the lens, and to limit the view, so that only the space of background to be taken in the picture is visible on the focussing screen.

Before commencing operations, thoroughly dust out the dark slide, and move the shutter up and down smartly several times, to detach dust from the grooves and working parts; also dust out the interior of the camera.

MANIPULATORY DETAILS.

Selecting, Cleaning, and Polishing Glasses.—For good work, the *best patent plate* glass should be used. If, in any case, inferior glass is employed, select the cleanest and smoothest side for coating. Many samples of common glass have a rough and a smooth side; the rough side may easily be felt by passing the finger nail over the surface. If this side were used for supporting the collodion, spots would inevitably result. Before commencing to clean the glasses, their edges should be ground off with a file or sandstone. For cleaning *new* glass a pad of clean linen, a dish or stream of clean water, and two clean linen cloths are necessary. The plate must be rubbed all over with the linen pad, while under a stream or in a dish of water; and after rinsing in pure water it is to be dried with one of the linen cloths, and polished with the other. To ascertain when the plate is clean, breathe on it gently and observe the moisture that condenses upon it; if this produces a uniform cloud, free from streaks, patches, or irregular markings of any kind, the plate is sufficiently clean, and may be stored away for use, but if streaks or marks appear in the coating of moisture, further rubbing is necessary. If, on again testing the plate by breathing on it, the same markings reappear, and a moderate amount of rubbing does not remove them, such plates should be set aside to be treated with rouge and alcohol. A

plate vice is extremely convenient for holding the plate during the operation of polishing. In polishing it must be remembered that hard rubbing is not necessary; *orderly*, *systematic* rubbing is what is required. The polishing cloth should be made into a small, plump pad or cushion, so as to be convenient for holding, and to allow of effective rubbing in any required part of the plate; it should be used with light pressure, and systematic regularity, each portion of the plate's surface being rubbed in turn. A very effective method of cleaning glasses consists in applying to the plate a few drops of old iodised bottoms of collodion, rubbing it over the surface with a tuft of cotton wool until dry, clearing off adhering particles with a clean cloth, and polishing as described. The cloths used in cleaning glasses should be washed with especial care, and have an extra rinsing in warm and quite pure water, so as to remove *every trace* of soap. Both sides of the glass, and the edges as well, should be cleaned, in order to avoid introducing dust or impurity into the bath. Contact of fingers with the cleaned surface should be carefully avoided.

Plates which have been used are more difficult to clean than new ones. If coated with collodion, but not varnished, immersion in or flooding with dilute nitric acid (1 acid to 5 water) will readily remove the film, after which they must be rinsed and cleaned as already directed. Plates that are varnished as well as coated with collodion, should be prepared for the cleaning process by immersion for several hours in a saturated solution of soda; or if this be heated, a few minutes' immersion is sufficient. A stock of glasses ought always to be kept clean and ready for use, for two reasons:— In the first place, it is desirable to avoid any dust at the

time of coating the plate; and in the next place, a newly cleaned glass having just been smartly rubbed, is generally in an electrical condition, and attracts particles of dust.

Polishing, Coating, and Exciting the Plate.—Previous to coating, fix one of the cleaned plates into a plate vice, and with a *perfectly clean* and soft linen cloth, or wash leather, made up into a smooth pad, give the surface a few soft and dexterous strokes, then sweep the surface lightly with a broad camel-hair brush, and glance along it to see that every particle of dust is removed; the plate is then ready for coating. Have a bottle of carefully decanted collodion with which to coat the plate. Remove all traces of dust or dried collodion from the outside of the bottle and the inside of the neck. Coat deliberately, but without hesitation. Whilst the excess of collodion is being drained off the plate, rock it from side to side (not backward and forward) until the drip has ceased and the film set. In warm weather the plate may then at once be immersed in the silver bath. In winter, a few seconds longer should elapse before immersing the plate. The immersion should be effected with a steady and regular dip. Soon after the plate is immersed, move it slightly from side to side by means of the dipper, and after half a minute, or a minute, raise it out of the bath, and re-immerse it several times. Allow the plate to remain in the bath three or four minutes; on removing it, drain it well, and dry the back with clean rag or blotting paper; or, if the plate is to be exposed to a brilliantly lighted object, apply to the back a piece of wetted red blotting paper, and let this remain attached to the plate during its exposure. During cold weather, if the plate is immersed in the silver bath too soon after coating with collodion,

peculiar feathery stains occur at the end of the plate from which the collodion has been drained. Before commencing operations, see that the surface of the silver bath is free from dust or scum. Each time the slide is used dry it carefully from any drainings of silver solution; and if stains occur at the lower corners of the plate, place pieces of blotting paper at the lower corners for the plate to rest upon. Place a black cloth over the dark slide before taking it out of the dark room, and keep the cloth over the camera and slide while lifting up the shutter. It is very important that this cloth should be free from dust. In carrying the dark slide between the dark room and camera, be careful not to knock it; and also, in placing it in the camera, avoid all concussion. Close the shutter softly; sending it down with a jerk is apt to splash the drainage of nitrate of silver solution over the film. After sensitising the plate, as little time as possible should elapse before development. If the plate is kept long, pinholes and stains are caused.

Development.—A portion of the developing solution, no more than sufficient to flood the plate, having been placed in a clean glass cup, is applied to the film, the greatest care being taken to prevent local action. It should be poured gently and quickly along one end of the plate, as near the edge as possible, and in such a manner that by slightly tilting the plate, the mass of fluid will flow over the entire surface of the plate in one unbroken wave. Then a short, quick, undulating motion must be given to the plate, so as to keep the mass of fluid upon the plate waving to and fro, and cause the silver solution, which is in and upon the film, to mix and blend with the iron solution, and thus obtain a uniform action upon every part. Whilst causing the developing solution to

wave about over the plate, as little as possible should be allowed to run off. *No more developer should be poured on than the plate will contain without overflowing;* any excess tends to lessen intensity in the first development. The developing action must be allowed to proceed as long as any detail remains undeveloped in the shades of the picture, and care must be taken not to continue it so long as to impair the purity of those parts of the film which should be entirely clear and free from veil. This part of the process is one which requires the exercise of great judgment and care. It is important that the action of the iron solution should be continued so long as it is seen to bring out further detail, or cause increase of intensity; but it is also necessary to avoid any trace of deposit on the shadows, such as would be caused by an excessively long-continued action of the developer. It is most desirable that the portion of developer first applied should be allowed to do its work thoroughly, and produce, if possible, all the intensity required; to this end, *as small a quantity as possible of the developer should be used.*

Intensifying.—If there is a deficiency of intensity in the negative, after developing with the iron solution, the film must be washed very thoroughly with water; and it is a good plan, and tending to cleanliness and perfection of result, to finish washing with an ounce or two of distilled water poured over the back and front of the plate. The plate may be set upright to drain (the lower corner resting on a small pad of blotting-paper or clean calico), while the required portion of the two re-developing solutions are mixed together in a perfectly clean measure-glass. The mixture must be both made and used without once opening the door of the dark room. The quantity taken of each solution should be no more than is necessary for the plate

to be immediately operated on. One drachm of each solution is quite sufficient for a small plate. The mixture being made, there must be no loss of time in using it. It must be poured over the plate, waved about for an instant, then returned to the measure, poured over the plate, and so on, again and again, until the required intensity is obtained.

Each time the plate is raised to drain off the re-developing mixture, a good opportunity is afforded for observing the progress of the operation, by looking through the most opaque parts against a yellow light placed at the level of the work table, and at some distance from the operator. The light may be daylight coming through a pane of yellow glass, set in the back of the dark closet; but the variableness of daylight is apt to mislead in judging of the opacity attained—a weak negative appearing quite strong when the light, coming through the yellow pane, is dull, and *vice versa*. On this account it is desirable to have a constant light, such as a small gas flame, or the flame of a candle lamp, screened by a pane of yellow glass covered with thin white paper, and set in such a position that, while the plate is held upright in the act of draining, the degree of opacity may be quickly and certainly determined.

The intensifying process is generally used before the negative is fixed; but there are occasions when it may be postponed with advantage until after fixing. The difference in result produced by the two methods is this:—Intensifying before fixing produces greater softness; after fixing, more contrast. If, therefore, the negative has had the right exposure, or a little under-exposure, a soft negative will be most easily secured by intensifying before fixing. If it has been over-exposed, and appears full of

detail, but wanting in contrast, then intensifying after fixing will give the most brilliant negative. Intensifying after fixing is very useful where, after re-developing and fixing a negative, it is discovered, on more careful examination, to be still slightly deficient in intensity. In this case (presuming the negative to have been fully exposed, and that the contrasts of light and shade are not too strong already), the greatest imaginable advantage will be experienced by the re-application of the pyrogallic acid and silver mixture—a fresh mixture if the one just used has become turbid. In re-developing *after* fixing, the greatest care is necessary to *wash away every trace* of the fixing agent from the film before commencing to re-develop, otherwise the shades of the negative become clouded by a red or coppery deposit.

Fixing.—Thoroughly wash the film with water, and then flood with either the hyposulphite or cyanide solutions; allow to act until the silver compounds in the film, which impart a creamy appearance to it, are entirely dissolved, and the shadows of the picture become quite clear. When this is done, the plate must receive a thorough washing with water, and after drying it should be varnished with MAWSON & SWAN'S extra hard varnish.

Characteristics of a Good Negative.—A good iron negative is generally a thin one, and it must commence with bare glass for its lowest scale of tones; but as in a good picture the lowest scale of tones, or black, is very sparingly used, a good negative will present some, but very little, bare glass, or points without any deposit whatever.

An iron negative may be thin, delicate, and soft, and yet give brilliant prints; *but it must possess its proper scale of tones or gradations.* This is really the point of importance.

To illustrate what we mean: suppose a picture to possess twenty gradations of tone—to be perfectly produced in photography, the negative must consist of twenty gradations of thickness or opacity of deposit—a negative which commences with bare glass, or entire transparency (allowing the uninterrupted passage of light for producing its deepest tones), and contains the various gradations up to twenty, may not appear very dense even in its highest light, and may yet give a perfect and brilliant print. A negative with the deposit over the deepest shadows of an opacity equivalent to ten gradations, must possess, in its highest light, a deposit equivalent to thirty gradations of thickness or opacity, in order to give a good print; and if it only reach twenty-five gradations of deposit in its most opaque part, although it may appear to the eye considerably more dense than the first-named negative of twenty gradations, it will nevertheless yield much less brilliant prints—prints, in fact, whose scale of tones will lack just five gradations, and which look meagre, poor, and comparatively worthless.

Under-exposure.—A want of detail where detail should appear, or excessive faintness in the detail of the shades, joined with full opacity of the high lights, are indications of insufficient exposure in the camera. The prints from an under-exposed camera would be described as "hard," and wanting in "half-tone."

Over-exposure produces a too general and equable deposit of silver over the entire film. The deepest shades become veiled, even without long continued developing; and in the different grades of light, which have acted upon the different parts of the film, are not represented by corresponding differences of opacity in these different parts, but appear too uniform in their degrees of opacity. In this case there will be (in the print) excess of *half-tone* that is to

say, those parts of the picture which should be rendered dark and with their detail faintly shown, are unduly light, black drapery appearing more grey than black, and the picture will be altogether flat and destitute of vigour. If, immediately after applying the developing fluid, it becomes evident, from an excessive rapidity of development, that the exposure has been too long, then the development should be stopped at an earlier stage than is usual with properly-exposed plates.

CAUSES OF FAILURE.

Fog may be caused by the use of imperfectly cleaned plates; silver bath containing organic matter or deficient nitric acid; diffused light in the camera or dark room; want of acid in the developer; under exposure and prolonged development; and slovenly manipulation in various forms.

Spots and Stains.—These also may be caused by slovenly manipulation, badly cleaned plates, and the use of unclean cloths; allowing the inner frame of the dark slide to get wet and dirty; allowing accumulation of drainings in the dark slide; neglecting to place clean blotting paper for the plate to rest upon; allowing pieces of dried collodion to fall upon the plate whilst coating it; immersing the plate in the bath too soon in cold weather; failing to cover the plate, &c., with the developer in one steady wave; pouring the developing solution on one part of the film; using the collodion too soon after it is iodised; dusty particles detached from the cork falling into the collodion.

Pinholes are caused by the use of the rough side of common glass; dust in the camera, in the dark slide, in the atmosphere, or in the bath; keeping the plate too long in the bath, or in the dark slide, is a frequent cause of pinholes; but a cause still more frequent is a deranged condition of the silver bath, the most usual derangement

being excess of iodo-nitrate of silver. When pinholes arise from this cause, dilute the bath with half its bulk of distilled water, filter out the turbidity, and add silver enough to make up the strength.

Insensitiveness and Want of Intensity.—The light very dull; the bath weak; the temperature low; too much nitric acid in the bath; the developer too old; the collodion too old. This condition of the collodion is indicated by its being excessively red. All these causes will tend to both these results.

Want of Half-Tone or Hardness arises from bad light, under-exposure, the use of a weak or old developer, or stopping the development too soon, and then over-intensifying.

Flatness arises from over-exposure, insufficient and injudicious intensifying, and also from any of the causes of fog or veiled shadows that have been mentioned.

The Film Leaving the Plate, Cracking during the Drying, or Dissolving when Varnished.—Imperfectly cleaned plates are the chief cause of the first and second of these troubles; the use of a nitrate bath containing much nitric acid, and immersing the plate too soon after coating, are also common causes. Under-exposure and long development, or intensifying, especially if the plates be large and any part imperfectly cleaned, will tend to cause the film to split, especially if dried by artificial heat, and somewhat unequally. *The film dissolving when varnished.* This mischance is very apt to occur when the collodion used in making the picture has been long iodised, and is consequently partly decomposed. In this case the addition of one-half or two-thirds of fresh collodion will remedy the evil. The dissolution of the film is also

frequently caused by using spirit varnish made with very strong alcohol, or containing some portion of wood naphtha, or by heating the plate too much when varnishing. In this case the addition to the varnish of a few drops of water will prevent this accident; but the best remedy is the employment of a proper varnish. The extra hard varnish prepared by MESSRS. MAWSON & SWAN will be found much less liable to dissolve the picture than the strong alcohol varnishes generally used.

General Hints.—When defects of any kind are discovered, proceed systematically to discover the cause, always beginning with the simplest and most obvious. For example, in case of foggy pictures, clean the plates with more scrupulous care, observe if any ammoniacal or other noxious vapours are escaping into the atmosphere of the dark room; reduce the amount of yellow light in the dark room; examine for diffused light in dark slide or camera; regulate the temperature to about 60 deg. Fahr. If these things do not remove the evil, make fresh developing solutions, test the bath, and, if necessary, as a last resource, make a new one. It is always desirable to have two baths in working order.

In winter, warm the dark room and glass house to 60 deg., as very great loss of sensitiveness and other difficulties proceed from operating at a low temperature.

CHAPTER II.

DRY COLLODION PROCESS.

The Tannin Process.—Dry collodion plates were formerly much used for landscape purposes, but in consequence of their comparative slowness, have long been entirely superseded by gelatine plates. For lantern slides and transparencies they, however, still find a use, and for such purposes are preferred by many.

The readiest manner of preparing dry collodion plates, when the silver bath is at hand, is, by its means, using MAWSON'S collodion for iron development; and after thoroughly washing the plate to remove every trace of free silver, soaking the film in a preservative solution, and drying. The preservative may consist of almost any substance of a gummy or saccharine nature, its function being merely to fill the pores of the collodion with matter soluble in water, and so prevent its shrinking into a hard impermeable skin on drying. One of the best, if not *the* best of preservatives is a solution of tannin which is recommended for the purpose. The following are the working details of the process:—

Cleaning the Plates.—The glass must be as carefully cleaned as for the wet process, and, after dusting, the edges of the plates are tipped with a solution of india-rubber, to the depth of an eighth of an inch, by means of a camel hair

pencil or a small piece of sponge, in order to prevent the collodion film from being detached during the prolonged washings. The india-rubber solution is made by dissolving three grains of pure black "bottle" rubber in an ounce of benzole free from grease.

The Collodion.—MAWSON's collodion for iron development gives very good results when used intact, but it is improved for dry plate purposes by the addition of two grains of bromide of cadmium to each ounce. It should be iodised some time before use, and have acquired a strong "straw" colour. Very old collodion, almost useless for wet plates, may be used with advantage for dry.

The Sensitising Bath.—The ordinary bath for wet plates may be used, but it must be distinctly acid. If a special bath be made for dry plates it is better to make it stronger and more acid, say according to the following formula:—

Nitrate of Silver	1 oz.
Distilled Water	10 oz.
Iodide of Potassium	½ gr.
Nitric Acid	2 drops

Mix as directed for the wet collodion bath.

The Preservative Solution.—This consists of a plain solution of tannin: though many operators prefer to add other ingredients, we have never found any advantage to result from their use, except in the case of alcohol, which mechanically assists the penetration of the solution into the film. Let the solution be made as follows:—

Pure Tannin	1 oz.
Water	40 oz.
Alcohol	4 oz.

Dissolve the tannin in the water and filter. If the solution

be perfectly *bright* the alcohol may be added at once, but if not it is better to allow it to stand for a few days until it becomes clear, and then to filter again. If it be required for use at once, the slight cloudiness, which is a feature of some samples of tannin when newly dissolved, will not matter, but if it be objected to may be easily removed in the following manner: take about a teaspoonful of liquid albumen and mix it thoroughly with half a drachm of strong ammonia, and add the mixture gradually to the tannin, shaking well. When mixed transfer the solution to a suitable vessel or glass or earthenware, and raise nearly to boiling point; allow it to cool and filter, when it will be perfectly bright. The solution when fresh is of a light amber colour, but it darkens and improves by keeping. Copious deposits of fungoid matter are formed in course of time, but these only require filtering out, and their formation appears to improve the preservation by removing some element that has a tendency to form spots.

The Preparation of the Plates.—The glass having been cleaned and edged with india-rubber, is placed on a pneumatic holder, and finally dusted before coating with collodion. The latter is applied in the ordinary manner, but is allowed to "set" for a longer time than for wet plates. When firmly set, immerse it in the silver bath, and allow it to remain there at least five minutes, preferably six or seven. Drain it thoroughly on removal, and then place it in a dish of distilled water for two or three minutes, after which it may be removed into ordinary water, and washed until the drippings show no trace of free silver. It is of the utmost importance that all the nitrate of silver is removed from the film, otherwise it will be hopelessly stained by contact with the preservative solution. Half-an-hour's soaking in repeated changes of water, and a final

rinse under the tap, or by pouring water from a jug, will generally suffice, after which the plate is ready for the preservation.

This may be applied by pouring it on and off the film several times, but greater uniformity is gained by immersing the plate in the solution in a dish for two or three minutes, the precise time being immaterial. It is then placed to drain, in an upright position, on strips of blotting paper, in a place free from light, dust, and draught.

The drying is an operation that requires some care, as, if any check occurs after the plate has commenced to dry, a mark will be left which will show in the finished picture. The best method to adopt is the following: After removal from the preservative bath, place the plate to drain on blotting paper, *with the sensitive surface to the wall.* This allows it to become quite surface dry without the edges becoming entirely desiccated. Now have ready a box or cupboard free from dust, round the sides of which the plates are ranged face outwards; at the last moment place in the centre a one or two gallon stone jar of hot water, close the whole and leave until the plates are quite dry.

The Exposure.—The exposure of these plates under a negative of ordinary density will average from thirty seconds to a minute, at a distance of a foot and a half from a good gas burner. In the camera, for an open landscape, from three to five minutes, with a stop of f/22, will be required.

The Development.—The following solutions will be required:—

No. 1.

Methylated Alcohol	1 oz.
Water	1 oz.

No. 2.

Pyrogallic Acid	60 gr.
Alcohol	1 oz.

No. 3.

Carbonate of Ammonia	60 gr.
Water	10 oz.

No. 4.

Bromide of Potassium	10 gr.
Water	1 oz.

To commence development place the plate on a pneumatic holder, and pour over it solution No. 1, and return the surplus to the bottle, as it may be used again. Now lay the plate in clean water while the developer is being prepared. For plates up to half plate size, two drachms of solution will suffice; take, then, in a measure glass, 1 drachm of water, and add to it five or six minims of solution No. 2, and one minim of No. 4, making up to two drachms with a drachm of No. 3. Give the plate a final rinse to be sure that the alcohol is washed out of the film, and flood the developer over it. The image will at once commence to appear, and if the exposure has been sufficient, in about half a minute or three quarters, the whole of the detail will be visible but very faintly, no portion of the image exhibiting any vigour. Now pour away the developer, wash the plate, and prepare the intensifier. This consists of the same ingredients, with a larger proportion of carbonate of ammonia. Take two drachms of No. 3, six minims of No. 1, and four minims of No. 4, mix and apply to the plate, when the image will rapidly intensify, and when sufficient density is gained it is carefully washed. If this treatment does not give it sufficient

strength the redeveloping solution, described under wet plates, may be applied.

Another mode of development which gives very fine results, but is slower in action, and necessitates a longer exposure, is performed as follows:—Take

No. 1.

Pyrogallic Acid	15 gr.
Citric Acid	5 gr.
Water	10 oz.

No. 2.

Nitrate of Silver	15 gr.
Water	1 oz.

After treating the plate with dilute alcohol and washing, pour over it 2 drachms of No. 1, to which 2 minims of No. 2 have been added. It will be a minute or two, perhaps longer, before the image begins to appear, but it then progresses regularly; if the detail be slow in appearing do not hurry, above all do not add more silver, but, on the contrary, if under-exposure appear certain, add a little more of No. 1. When all the details have been got out, add three or four drops more of No. 2, when the image will intensify rapidly. This method gives pictures of such beauty and richness that despite its disadvantages of slowness it was formerly a great favourite.

Fixing.—Fix in a solution of

Hyposulphite of Soda	1 oz.
Water	6 oz.

This will take longer to fix than the cyanide of potassium but the result is superior. Wash very thoroughly before drying.

Varnishing.—Varnish with MAWSON & SWAN'S *crystal*

positive varnish, which is admirably adapted for these plates.

The Collodio-bromide Process.—When a nitrate of silver bath is not at hand, dry collodion plates may be prepared by the collodio-bromide or collodion-emulsion process. In this case an emulsion of bromide of silver in collodion—obtainable ready prepared—is used, and after the preparation of the plate the manipulations are very similar to those described in connection with tannin plates.

Preparing the Plates.—The glass is cleaned, edged with India-rubber, and dusted as before, and the emulsion poured on to it in the same manner as collodion. A word or two may be said with regard to the emulsion. Half-an hour before use it should be well shaken up, as the bromide of silver rapidly settles to the bottom of the bottle when at rest, and it is better to filter it lightly through a plug of cotton or "glass-wool" pressed into the neck of a funnel. If the emulsion should become too thick to flow comfortably, it must be diluted with a mixture of ether and alcohol in the proportion of 3 : 1.

The plate having been coated requires no further treatment but drying, and this is a matter requiring less care than in the case of bath plates, as the emulsion is less liable to develop drying marks. The plates may be allowed to dry spontaneously, or heat may be used.

Exposure.—The emulsion plates are at least three or four times quicker than tannin plates; from ten to fifteen seconds to gaslight, or half a minute to a minute in the camera being sufficient.

Development.—The development and developing solutions are very similar to those employed for tannin plates, only substituting the following for No. 3.

Liquor Ammonia sg ·880	1 dr.
Water	7 dr.

The plate having been treated with alcohol and washed is flooded with

Water	2 dr.
Solution No. 2, page 49	6 min.
Solution No. 3 ,, ...	2 min.
Solution No. 4 ,, ...	2 min.

and when all the details are faintly shown return it to the measure, and add three or four minims each of solutions 3 and 4. This will bring up the density to the required point, or if it should fail to do so the silver method of re-development must be resorted to.

Fixing and Varnishing are precisely as in tannin plates.

CHAPTER III.

THE GELATINO-BROMIDE PROCESS.

Introduction.—For upwards of a quarter of a century the wet collodion process held almost undisputed sway as the process *par* excellence for general purposes, but especially for portraiture and all rapid work. A silent revolution had however been at work for some years, when, in 1878, Mr. J. W. Swan, recognising the capabilities of the then young gelatino-bromide process entered upon that line of experiment, and in the same year Mawson & Swan introduced the first commercial gelatine plates for studio work.

It was not for some years after the first introduction of the gelatino-bromide process that the photographic world awoke to the immense advantages it offered; loth to relinquish old associations, the majority clung tenaciously to collodion and bath, and the use of gelatine plates was for a time almost wholly confined to amateurs and landscape photographers. In 1874 Kennett introduced a sensitive gelatine emulsion, by means of which amateurs and others could prepare their own plates, and later—early in 1878—Bennett demonstrated the wonderful rapidity that could be obtained with these plates, but it was not until the commercial supply of gelatine plates, perfect in every respect for studio use, became an accomplished fact, the photographers as a body availed themselves of their use.

They began to recognise the fact that a new era was commencing for them; the old wet process was distanced in the race for rapidity, if not for quality, and an entirely new field of labour was opened up, comprising a class of work hitherto deemed impracticable.

Not only was a greatly extended scope thus given to photography, but it was shorn of many of its former difficulties and cares, for by the use of the new dry plates, amateurs and others comparatively ignorant of chemistry and photographic manipulations, were enabled after a few lessons, to execute work which under the old *regime* would have required hard work and constant application to produce. As a result there was at once a large accession of amateurs to the ranks of photography, and the camera is now the almost universal companion of the tourist, while numerous professional men, architects, surveyors, engineers, as well as manufacturers, make constant use of the almost boundless facilities thus afforded them.

As Mawson & Swan were foremost in recognising the future value of gelatino-bromide plates, so they have not been backward in meeting the constantly increasing demands upon their resources. Not only have they gone on steadily improving the character of their plates and of the appliances for their production, but in order to ensure to the fullest the invaluable qualities of high sensitiveness, clearness and brilliancy of image, and uniformity, they have erected an extensive factory replete with every convenience for the rapid production of dry plates in large quantities, and of the utmost perfection in every respect, chemical and mechanical.

In order to ensure uniformity of film, the plates are coated by means of the most perfect automatic machinery, driven by a gas engine; the glass is carefully picked before

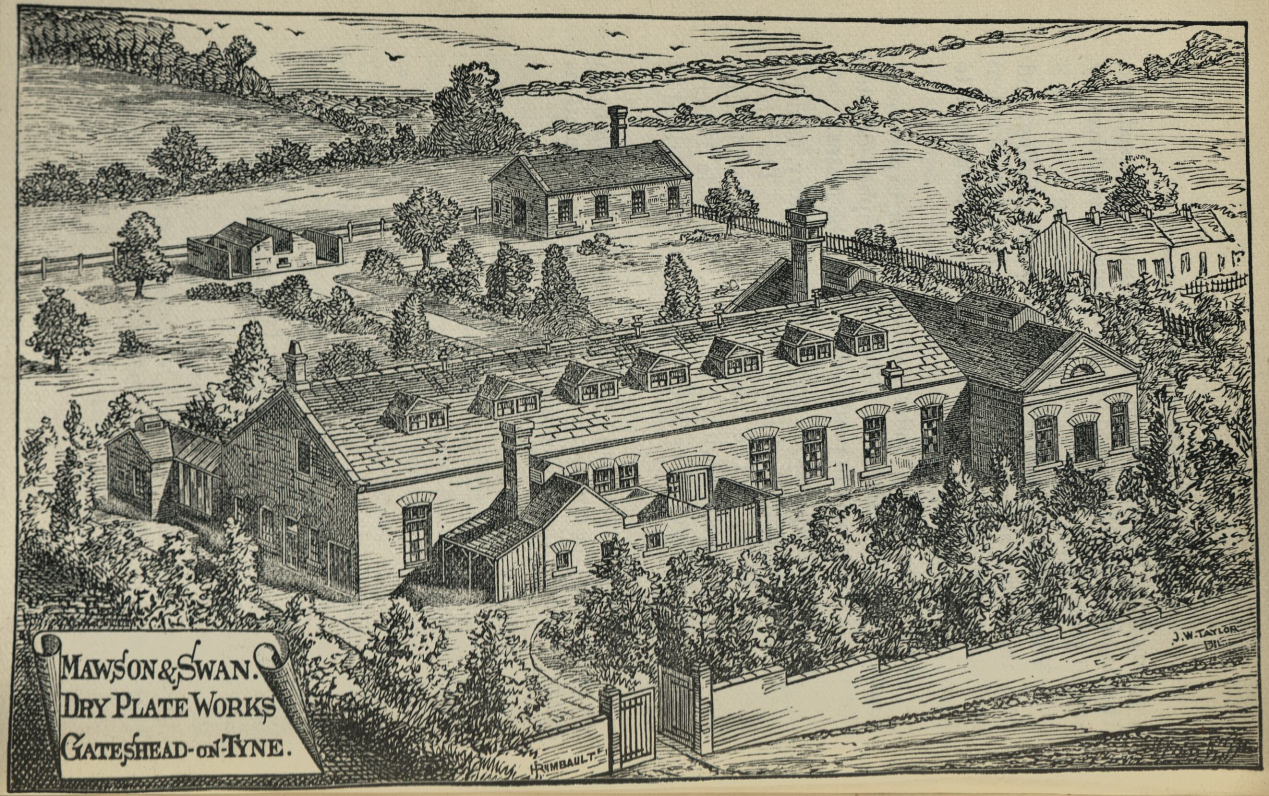
passing into the cutting room, only the best being used, and this is cleaned and polished by special machines, driven by steam power.

The plates are examined individually after coating, and only those that are absolutely free from faults, mechanical and otherwise, and cut exactly to size, are permitted to leave the factory.

The laboratory is under the care of an experienced chemist, and in addition a skilled photographer devotes the whole of his time to practically testing the plates.

The following plates are prepared at the factory, namely, "The Mawson Plate," "The Castle Plate," "The Photo Mechanical Plate," "The Lantern Plate," "The Mawson Opal Plate," together with "M. & S's. Bromide Paper," the special qualities of each of which will be described as we proceed.

It only now remains to describe briefly the dark room arrangements, the chemicals required, and the manipulations connected with the production of the negative.


MAWSON & SWAN.
DRY PLATE WORKS
GATESHEAD-ON-TYNE.
J. W. TAYLOR
HEMBAULT

THE DARK ROOM APPLIANCES AND CHEMICALS.

The beginner with gelatine plates if already acquainted with the working of the wet process, must be prepared to undertake an entirely new set of operations, and to forget much that he has already learned, so far, at least, as it concerns dry plates. With altered manipulations and requirements, a fresh arrangement of the dark room is necessitated; the accompanying diagram showing what will be found convenient.

In consequence of the greatly increased sensitiveness of the plates, it follows that additional care is requisite in the matter of lighting; the first important point to be seen to is, then, the window; while what has been already said, in speaking of the dark room for wet plates, with regard to carefully excluding all stray white light (see page 31) applies with still greater force here.

The window which, if possible, should face north, should be of moderate size, so as to admit plenty of light of the right quality, say about two feet square. It should be glazed with two thicknesses of ruby glass, and be provided with a black blind to be drawn down so as to cover the greater part of the glass, during the early stage of development.

There are many substitutes for ruby glass recommended,

and in the market, differing both in colour and material, but we strongly recommend the employment of ruby glass only. The extreme sensitiveness of MAWSON & SWAN'S plates renders the use of any other colour or combination of colours, such as yellow, orange, or green, with ruby, unsafe in the extreme; while when coloured papers or fabrics are used, however "safe" they may be when new, the dyes are so rapidly acted upon by light, and moreover, so readily injured by splashes of chemicals that they are not to be depended upon.

Many operators eschew daylight, preferring to trust entirely to lamp or gaslight, as being, not only safer but more uniform in character and strength. There is much justice in this preference, as any great variation in the force of the light renders it extremely difficult to judge the printing value of the negative under treatment, and this leads to want of uniformity. Where a north aspect cannot be selected for the window, we should strongly counsel the use of artificial light; but in any case it is well to have it at hand when, by lowering the opaque blind, the daylight may be cut off, and the lamp or gas brought into use.

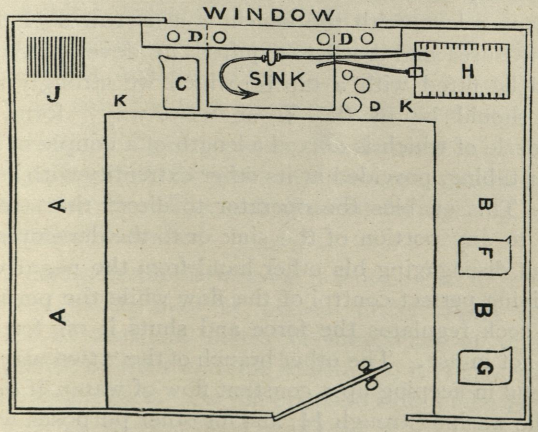
An advantage with artificial light is that it may be made to assist in the ventilation of the room, a matter of no little importance, when it is considered that the operator is shut up in a confined space for long periods, and with the atmosphere loaded with ammoniacal vapours. Whatever may be the source of light—gas or paraffin—if it be enclosed in a lantern provided with a chimney communicating with the outer air, the products of combustion will be led off, and replaced by the ammonia-charged air from the interior of the room, a constant outward stream being thus kept up. If, as will be naturally the case, the lantern be close to the developing sink, the ammonia fumes will be drawn off before

they have time to diffuse themselves throughout the room.

The following is a description of the dark room, which differs slightly in the desirability for more bench space from that for wet collodion.

Reference.

A A Portion of shelf for slides, plate boxes, &c.
B B Portions of shelf for alum fixing bath.
C Developing dish.
D D D Developing measures, bottles, &c.
E Double tap with tube and clip.
F Fixing bath.
G Alum bath.
H Washing trough.
J Negative draining rack.
K K Developing table to slope toward sink.



Description.—The room may be similar in dimensions to that described under the wet collodion process, namely, about eight feet by six; the working shelf, however,

extends round the whole of three sides in order to provide more space, the door being placed nearly opposite the window. The edges of the door should be nailed over with strips of list to prevent any light passing over the operator to the plate.

The same order of rotation is observed in carrying out the different operations as in the wet plate developing room; thus we commence at the left hand side of the room, reserving the portion of the bench **A A** for the dark slides and plate boxes; for filling and unfilling the slides, and packing or unpacking plates. Here, too, the dusting brush, note book and pencil, and everything not directly connected with development should be kept, and everything in the shape of chemicals or moisture stringently banished.

The sink, as in the previously described dark room, is immediately in front of the window, below which, and nearly on a level with the bench, is a narrow shelf for the few measures and bottles required in development. It should be fitted with a tap **E**, which we strongly recommend should be of the **T** or "two-way" form, upon one nozzle of which is affixed a length of a couple of feet of rubber tubing, provided at its other extremity with a spring clip. This enables the operator to direct the stream of water to any portion of the sink or to the developing cup without disengaging his other hand from the negative, the clip giving perfect control of the flow while the permanent brass cock regulates the force and shuts it off for safety when not in use. The other branch of the "two way" will be useful in keeping up a constant flow of water, if desired, into the washing trough **H**, and for other purposes without interfering with the developing branch.

The developing dish should have a permanent place at **C** when not in actual use, while the developing cup, or

cups, occupy the right hand side of the sink, and the bottles and measures the shelf at **D D D**, and on the bench **K**. The right hand portion of the bench **B B** is devoted to the fixing bath **F**, and the alum bath **G**, and similar purposes, the hypo thus being isolated from the other chemicals and operations.

After fixing the negative, the first rinse or wash to remove the great bulk of hypo will be performed at the tap and over the sink, after which the negative will be placed in the grooved tank **H** to complete its washing.

The position indicated will be found convenient as being not only out of the way, but as readily permitting communication with the water supply and the sink, in order to keep up, by means of a couple of flexible tubes, a constant flow of water through the tank.

In similar manner, the opposite corner at **J** will be found convenient for the draining or drying rack, where the negatives after washing will be out of harm's way, and not liable to be splashed with either water or chemicals.

If artificial light be used, the lantern may be conveniently placed in the centre of the narrow shelf below the window, where it will be well situated for lighting, as well as ventilating purposes.

To complete the dark room, it will be well to provide a cupboard, which may be placed under **A A** for the reception of sensitive plates or emulsions, of which, in consequence of their extreme sensibility, it is impossible to take too much care. On the opposite side, under **B B**, an open rack or shelves may be placed to hold dishes, stock bottles, and utensils when not in use. Other shelves for chemicals and apparatus may be placed against the wall above **A A** and **B B**, if desired, though it is scarcely

advisable to over-crowd the dark room with shelving, which, as we remarked in connection with the wet plate dark room, only tends to harbour dust and dirt.

The above description and accompanying diagram are given merely as suggestive of the requirements and arrangements of a comfortable developing room for an amateur, and not as tying him to any fixed plan. The arrangements, both as to dimensions and other conditions, will, in the majority of instances, be dependent upon circumstances over which the amateur possibly may have little control; but our plan will, at least, help him to make the best of those circumstances.

Appliances.—Next we come to the appliances required during development, and the subsequent operations the negative has to undergo before leaving the dark room; these are few and simple, and their number should be kept down as far as possible, in order that valuable space may not be uselessly occupied. The dark room should, in fact, be kept to its legitimate purpose, and not used as a storage place for chemicals and appliances that are required elsewhere.

First, we shall require a set of graduated measures for the purpose of mixing the developing solutions; these may consist of a two-drachm measure divided in minims, for very small quantities a two ounce, divided into drachms, and a ten or twenty ounce for larger quantities of stock solutions. A set of scales and weights, the scales provided with glass pans, which are more easily kept clean than brass ones, the weights, of brass, from one grain to two drachms. The ordinary apothecaries' scales, with grain, scruple, and drachm weights, as usually supplied in oak or mahogany box, will answer every requirement.

One or two developing cups for large or small quan-

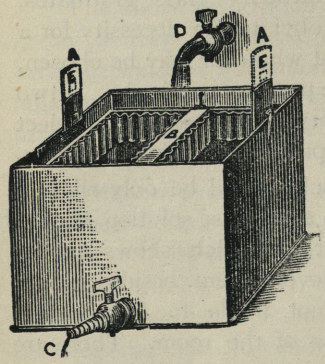
tities of developer will also be needed, and for this purpose chemical beakers of thin glass prove very useful, though they require care in handling, owing to their fragility. Many operators employ the ordinary glass graduates, which are stronger, and besides obviate the necessity for a separate measure in mixing; but whatever may be chosen, let them not be too small for the purpose required. If two ounces of solution be the quantity usually employed select a vessel of about four ounces capacity, and so in proportion.

The Developing Dish, which should be only slightly larger than the plate, in order to economise solution, should be of ebonite, the black colour of which shows up the image more distinctly during development, besides which, they are light, strong, and not liable to fracture by accidental knocks, with dimness of the room. There are two forms in general use, a stout pattern, with square corners and upright sides, and a lighter with sloping sides, moulded from thin sheet. The former is preferable for large plates, but the latter answers for small sizes, and is cheaper.

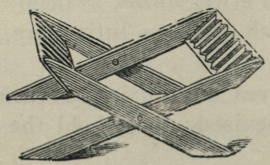
For the fixing and alum solutions porcelain dishes are ordinarily employed, and of these three or four should be provided, each being kept for its special purpose, clearing, intensifying, and reducing solutions, being also occasionally required. As these solutions are all made in bulk, and frequently used, the dishes need not be restricted in size as directed for developing, but may, with advantage, be large enough to hold two or more negatives at once. These dishes are made in two forms, "deep" and "shallow;" the former, though costing a little more, are to be preferred.

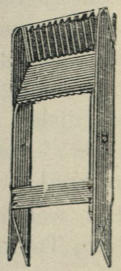
For washing the negatives after fixing, a variety of Washing Tanks have been devised; these hold the plates

in grooves, and, where numbers of negatives have to be washed, economise space by doing away with the necessity of having a large number of flat dishes spread about the work bench. One of the most convenient of these is shown on the figure; it consists of a stout zinc body, oblong in shape, with a movable framework of grooves round the four sides, so arranged that two sizes of plates can be washed according to whether they are placed the long or the cross way of the tank. A movable cross-bar, **B**, also carrying grooves, can be adjusted as to accommodate plates of smaller size. The inner frame, holding the negatives, can be lifted out bodily by the projecting handles **E E**, for convenience of removing the plates to the drying rack. The tank may be placed under the tap as shown, or more conveniently, as we have arranged in our plan of a dark room, the water being led to it from the tap, and the waste from **C** back to the sink by two flexible tubes. Other forms in earthenware and wood will be found mentioned in MAWSON & SWAN'S illustrated catalogue.



The list of necessary apparatus is completed by the draining rack, a convenient form of which, open for use,





and folded for packing away, is figured. It is stoutly made of hard wood, varnished, and each size will take plates of various dimensions.

Chemicals.—The following list of chemicals will complete the dark room equipment, and are therefore mentioned here, though their uses will be explained in connection with the manipulations. The quantities required of each can be estimated from the formulæ that will be given, and the amount of work to be executed.

Acid Citric
,, Hydrochloric.
,, Pyrogallic
Alum.
,, Chrome.
Ammonia Solution.
Ammonium Bromide.
Iron Protosulphate.
,, Perchloride.
Mercury Perchloride.
Potassium Carbonate.
,, Bromide.
Potassium Ferricyanide.
,, Metabisulphite.
,, Oxalate.
Sodium Carbonate.
,, Hyposulphite.
,, Sulphite.

DARK ROOM MANIPULATIONS.

We will now proceed to describe *seriatim* the various manipulations that have to be gone through from commencing to handle the sensitive plate to the completion of the negative, premising that our sketch of the various operations must necessarily be brief, though we shall endeavour to render it as lucid and clear to the beginner as can be without the advantages of a practical demonstration.

Filling the Slides, &c.—The first operation that must of necessity take place in the dark room is the transfer of the plates from their original packages to the dark slides for exposure. We of course assume that every care has been previously taken to ensure that the room is what is termed "safe," that is, as we mentioned earlier, that no white light finds its way in. It only remains then to see that the door is carefully closed, and to remember always that the plates are more or less sensitive even to ruby light, and must, therefore, be exposed to that no longer than is absolutely necessary, and that at as great a distance as possible from the window.

Upon opening the box of plates take off the successive wrappings of paper, carefully avoiding any rough usage that might injure the films; have the dark slides ready opened and dusted to receive the plates, and as each is

removed from the package, pass the dusting brush rapidly over its surface, and transfer it to its place in the slide, closing the latter as soon as it has its complement of plates. This should be done in the darkest part of the room that will permit the operator to see what he is doing; and here it may be remarked that it takes some little time for the eye to become accustomed to the feeble light of the developing room, and it is therefore, after entering direct from daylight, advisable to find some other occupation before handling sensitive plates, in order to give the eye time to adapt itself to the light. By attending to this, comfort, as well as safety, will be studied.

The plates are usually wrapped in separate half-dozens: if only six are to be placed in the slides at once, the remaining half-dozen are better left in their original package in the cupboard provided for the purpose until wanted; they are then better protected, not only from access of light, but from damp and other atmospheric influences, than if transferred to a plate box. The plate box is extremely useful for storing negatives, but should rarely be used for sensitive plates.

On opening a packet of plates make a practice of at once clearing away the empty box and wrapping papers, as nothing makes the dark room so untidy and uncomfortable as to have loose boxes and paper littered about. Carefully preserve the empty boxes, as they will prove useful for a variety of purposes, as also will the wrapping paper, if untorn.

Exposure.—Though not, strictly speaking, a dark room operation, the exposure of the plate is so intimately connected with the subsequent one of development, that we may well include it here; not, however, with the intent of

giving any definite rules as to absolute time, but rather, a few general instructions to be observed. The circumstances of light, subject, lens, season, time of day, and sensitiveness of plate, all contribute so greatly to modify exposure, that it is really ridiculous to attempt, as is frequently done, to give even an approximate idea of what is required. The cut and dried expression that "for a well-lit, open landscape, using f/22, one second will suffice," may mean anything or nothing to one who is accustomed to exposure, but to a beginner it is only puzzling, if not misleading. He has to be instructed as to what is "an open landscape," and when it is considered "well-lit;" but even then the formula takes no cognizance of the season of the year, and the time of day, both elements of quite as great importance as any of the others. The only real way of gaining experience in exposure is to devote a few plates to trials, noting by some mental standard the general character of the subject, if a landscape, and its illuminations, as well as the circumstances of time and season; give three or four exposures, varying in length, and take notice of the results. Then study the tables of the value of the light at different hours of the day and seasons of the year, and by the application of a little care and observation the novice will rapidly gain an insight into the mystery of exposing, that he would not otherwise acquire. He must also bear in mind that there is a great deal of what is termed "latitude" in exposure, that is to say, that we are not tied to one absolute point, but that any period within certain limits will give a good negative *if the development be suited to the exposure.* Here is where the science of development lies. Two similar plates may be exposed one for, say one second, the other for five, and a skilful operator will have no difficulty in developing both into equally good negatives. One other point should

always be held in view, namely, that though over-exposure, or rather, *a longer exposure than is absolutely necessary*, can be corrected or held in check during development, no modification of the latter process will make up for under-exposure. Where the light has not acted, or has acted insufficiently, there can be no result, or only an imperfect one; therefore, except where compelled to curtail the exposure, as in taking moving objects, always give full time. It is usually said that beginners err on the side of over rather than of under-exposure, but this statement is only relatively true. Given a developing formula that is calculated for the shortest exposure a plate will bear, it is only to be expected that, in the hands of one inexperienced in "humouring" the development, things will go wrong if the *minimum* exposure be exceeded.

Development.—We now come to the most important step in the process of negative production—the development; for it is at this stage that the skill of the photographer is exercised, and the impression formed in the camera brought to a successful issue. We shall first describe the necessary solutions, and afterwards the method of using them.

Development may be performed by either of two methods, known respectively as the "alkaline" and "ferrous oxalate" or "iron." In the first, pyrogallic acid, in conjunction with an alkali, is the active agent; in the other, oxalate of iron dissolved in a solution of oxalate of potash. There is a great variety of formulæ based on these two principles, and though essentially the same, it is often found that they differ in their behaviour with different plates. As a rule it is wise to adopt the formula recommended by the maker of the plates, rather than to try every new one that may be put forward. Though MAWSON & SWAN'S

plates may be developed by any of the established formulæ, the following are recommended by them :—

THE MAWSON PLATE DEVELOPER.

STOCK SOLUTION.

Pyro	1 oz.	Avoird.
Ammonium Bromide	½ oz.	,,
Metabisulphite of Potash	1 oz.	,,
Distilled Water to make up to	11 oz.	,,

The sulphite and bromide must be thoroughly dissolved in a part of the water before the pyro is added.

FOR STUDIO WORK.

I.—Stock Solution	1½ oz.	
Distilled Water	18½ oz.	
II.—Ammonia (·890)	2½ drs.	
Distilled Water	20 oz.	

Use equal parts of I. and II. mixed just before development.

In mixing the stock solution the instructions must be implicitly followed, otherwise it will be much discoloured. Pyrogallic acid is peculiarly liable to discolouration in the presence of water, and to prevent this, and to preserve it from oxidation, the metabisulphite of potash is employed. If the pyro be dissolved first, a certain amount of discolouration will occur instantly, and before the bisulphite can be dissolved ; and what is worse, it will go on gradually increasing. But if the metabisulphite be just dissolved as recommended, the colour of the solution will be a pale straw, which will not change for a very long period.

Developer for Mawson & Swan's New Cheap Dry Plates:

"THE CASTLE" PLATE.

STOCK SOLUTION.

Pyro	1 oz.	Avoird.
Ammon. Bromide	1 oz.	,,
Nitric Acid	30 Minims.	

Dist. Water to make up to 11 oz. fluid.

I.—Stock Solution	1½ oz.
Dist Water.	18½ oz.
II.—Liq. Ammonia (·890)	2½ drs.
Dist. Water	20 oz.

Use equal parts of I. and II. mixed just before development.

Here nitric acid is substituted for metabisulphite of potash as the preservative agent, but what was said in regard to the latter bears with equal force upon its substitute. The nitric acid must be added to the water before the pyro is dissolved.

Let it be observed that in both the above formulæ the quantity of water is given as "to make up 11 ounces." This quantity is selected because each drachm of solution then contains, as nearly as possible, 5 grains of pyro, which forms a definite basis on which to found calculations. In making the solution, it will not do to measure out eleven ounces of water, and then proceed to dissolve the other ingredients; this plan would result in a final volume of solution in excess of that given. The proper way is to dissolve the different ingredients in a portion of the water—say eight ounces—and, after solution, to add more until the quantity reaches 11 ounces.

THE MAWSON PHOTO-MECHANICAL PLATE.

The developer recommended for these plates is composed as follows:

A	Pyrogallic Acid	60 gr.
	Meta Bi-Sulphite of Potash	60 gr.
	Distilled Water	20 oz.
B	Liquor Ammonia	2 drachms.
	Bromide Ammonia	30 gr.
	Distilled Water	20 oz.

Use equal parts of **A** and **B**.

The development commences rather slowly, but afterwards proceeds more rapidly, and is completed in from 4 to 6 minutes.

The solution being ready, let us now proceed to develop a plate. We have at hand the developing tray, developing cup, measure, and a flat camel hair dusting brush, preferably mounted without metal. We need make no distinction between the different classes of plates since their general behaviour is in all respects similar. We will suppose the plate is of half-plate size, or $6\frac{1}{2} \times 4\frac{3}{4}$ inches, which will require two ounces of developer.

Into the developing cup we measure one ounce each of solutions I. and II.; take the plate from the slide and quickly lay it face upwards in the developing tray, and with a steady, rapid sweep, spread the contents of the developing cup evenly over the surface. The first care must be to see that the whole of the surface is covered, the next that there are no air bubbles adhering to the film, but these observations must be rapidly made and acted upon. If the surface is not covered, the dish must be rapidly

tilted in that direction, and any air bubbles must be dislodged by means of a camel hair brush which, (when not in use) must be kept immersed in clean water. These operations must be quickly performed, if they are needed, or indelible marks will be left on the film; besides which it is desirable at this stage to expose the plate as little as possible to the light, but to keep it shaded with a piece of cardboard or other suitable means. Covered in this manner the dish is gently rocked from side to side, in order to keep the developer in constant motion, for about thirty seconds, when, if correctly exposed, the image will commence to appear. From this moment it must be carefully watched, shaded from the light as much as possible at the same time. At first the high lights or brighter portions of the subject only will be seen; then gradually the half tones and less brilliantly illuminated portions will become visible, and still more slowly the details in the darker portions of the picture. The gradual development of the picture is very beautiful to watch, as the originally spotless surface is first covered with irregular dark blotches, which slowly spread and coalesce into the semblance of a picture, until at last the once white surface assumes an almost uniform leaden gray, relieved here and there by lighter blotches, representing the deepest shadows.

Looking at the surface of the place, the beauty of the picture, its clearness and distinctness, which at one stage of the operation were very noticeable, appear to be gone, and the negative spoilt. Not so, however, if we raise it from the dish, and holding it up before the window for a brief moment, look through the image, we shall perhaps find that it is still very thin and feeble—lacks density, to use the technical term—so we return it to the developing dish for a while longer, and continue to examine it at intervals by

transmitted light until it is judged to have gained sufficient strength.

This, with a properly exposed plate, such as we are supposed to be treating, should occur in from three to four minutes. The developing solution is now poured away, and dish and plate copiously washed with water to remove the last traces of the discoloured solution. A mere surface wash is sufficient, for it must be considered that the swollen film of gelatine that holds the image has absorbed no small quantity of the deeply coloured solution, which must all be eliminated if the shadows of our negative are to be pure and unstained. Therefore, after a good rinse under the tap, let the plate soak in clean water for a few minutes, when, after a final rinse, it is ready for the next operation.

But now we will assume that in thirty seconds from the application of the developer no sign of an image makes its appearance; there is, then, a strong presumption of under-exposure. If forty, forty-five seconds pass and still no image, or perhaps only a faint trace of the sky, if a landscape, or the lighted side of the face and short front or collar, if a portrait, we may be sure that the exposure has been too short, and we proceed at once to do all that lies in our power to remedy it. This is to strengthen the developer by the addition of more of solution No. 2, the quantity being ruled by the degree of apparent under-exposure, always bearing in mind that there is a point beyond which this treatment cannot be pushed without causing "fog" or general veiling of the image. If the under-exposure be only slight, amounting rather to a slowness on the part of the half tones to appear, another drachm or two drachms of Solution 2 may be poured into the developing cup, and the contents of the dish mixed

with it, and returned at once to the plate. A golden rule to be observed in connection with under-exposure is, that *patience* will generally do more than forcing; patient treatment will often coax out reluctant detail, when sudden or violent forcing, that is, rapid and frequent reinforcement of the developer—would have only resulted in hopeless fog.

In worse cases, as when only the high lights have appeared after one minute's application of the developer, the better plan is to pour the solution away, and wash the plate thoroughly, leaving it to soak, shaded from the light while a fresh developer is mixed. The course to be pursued now is to strengthen the developer, so as to force out the half-tones, and at the same time to avoid as far as possible giving too much density to the better exposed high lights. As the No. 2 solution supplies the energy of development, and No. 1 that of giving density, it follows that if we increase the one and reduce the other we shall gain the end; for while the developing power is increased the solution is incapable of giving the strong contrasts of density the normal mixture gives. The new mixture may, therefore, consist of varying quantities, until, in very bad cases, one ounce of No. 1, and two ounces of No. 2, or a proportion of one to two are used.

But, as we have already said, it is impossible to render a perfect result out of a seriously under-exposed plate, and it is only comparatively slight cases that will give even moderate satisfaction.

Let us now turn to the reverse fault, over-exposure. In this case either the image commences to appear almost immediately the developer is applied, or after a short pause the high lights and details flash out simultaneously. Prompt steps must be taken under such circumstances to arrest any further action of the developer by quickly

washing the plate, otherwise the half-tones will be brought out and the shadows veiled long before sufficient printing density has been acquired by the high lights. The conditions now are the reverse of those prevailing in under-exposure: we have to create rather than subdue contrast to hold back the shadows and half-shadows until the lights have had time to build up a sufficiently thick image, and this end is naturally attained by reversing the course adopted in the previous case, namely, by increasing the proportion of pyro and reducing that of ammonia. When therefore, over-exposure is recognised, especially if it be considerable, after washing the plate well as directed, pour into the developing dish two ounces of solution No. 1, and allow the plate to soak for half-a-minute or so; then place in the developing measure *one drachm* of the ammonia solution, thoroughly mix it by pouring the pyro-solution into it, and then return to the dish. This small proportion of ammonia will suffice to incite the action of the pyro upon the lights of the picture and cause them to gain density, while its effect upon the less strongly impressed portions is considerably weaker; these latter are therefore held in check while the lights progress, and so contrast and density are produced, when there would be otherwise nothing but a flat and feeble image. When the development is thus got under command, fresh additions of small quantities of the ammonia solution may be added as required, care being taken not to hurry the operation. Over-exposure, like its reverse, requires the greatest patience in development.

It is a good plan, adopted by many operators, to keep at hand in addition to solution 1 and 2, a third, consisting of thirty grains of bromide of ammonium dissolved in an ounce of water; this is extremely useful in all cases of over-

exposure ; if the case be but a slight one three or four drops of this solution added to the developer will supply the needful check, or in worse instances, the developer may be poured away, and a drachm of bromide solution with a little water poured on, to immediately arrest any further action. A brief soaking in the dilute bromide will apply such a check that the subsequent operations will be well under command.

These are merely the main lines upon which to proceed in treating plates which have been under or over-exposed *for treatment with a normal developer*, for the exposure and development always bear a direct relation to one another; and when development is fully mastered, the matter of exposure becomes practically of no moment, provided, as we have previously said, it has been sufficient. A very general practice is to systematically give a "full" exposure, by which is meant an exposure in excess of what is absolutely necessary, and to commence to develop with a much smaller proportion of ammonia than that given in our normal instructions. In this manner the operator may feel his way to the result he desires, being troubled on the one hand by no necessity for forcing while the operation is under perfect control.

However difficult development may seem in description, it is really not so in practice, if only the principle be grasped; the intelligent learner who carefully applies the preceding remarks will find after developing a few plates that both exposure and development are perfectly easy to manage.

Before leaving the subject of development, a description may be given of the second method previously mentioned, by means of ferrous oxalate. The active or reducing agent in this case is the protoxalate of iron, which is, however, an insoluble substance, and cannot therefore be employed

alone: it is readily soluble in oxalate of potash, in which state it is employed; and the original method of mixing the developer was to dissolve the precipitated oxalate of iron directly in a hot solution of the neutral oxalate of potash. A much simpler and on the whole superior plan has, however, come into use, in which by mixing solution of ferrous-sulphate or proto-sulphate of iron, with excess of neutral oxalate of potash, the iron is converted into oxalate and held in solution by the excess of potash salt. This solution necessarily contains the sulphate of potash produced by double decomposition, but this is rather an advantage than otherwise, as it acts as a mild restrainer, and assists in giving clearness of image. The following solutions may be made in quantity and kept separately :—

No. 1.

Neutral Oxalate of Potash	5 oz.
Distilled Water	20 oz.
Bromide of Potassium	10 gr.

No. 2.

Ferrous Sulphate	1½ oz.
Distilled Water	4½ oz.
Sulphuric Acid	1 min.

Distilled water should be used, otherwise the lime in ordinary water will cause turbidity from formation of oxalate. No. 1 will keep indefinitely, but No. 2 should not be used after it turns brown or yellow. When required for use, pour four parts of No. 1 rapidly into one part of No. 2. The resulting solution will be of a deep red colour.

The ferrous oxalate developer acts in much the same manner as alkaline pyro, though it does not possess the same elasticity in use. The exposure must be more carefully timed as the power of modifying the development is

greatly reduced. By mixing a certain proportion of old developer with fresh, a restraining action is produced for over-exposure, but the control is far less than with alkaline pyro. The same quantity of solution may be used for several different developments if performed in rapid succession, but it loses its power rapidly by keeping. After development, the plates require treatment with a very dilute solution of hydrochloric acid to remove a slight opalescent deposit of oxalate of lime that forms in washing; otherwise, the image produced by ferrous oxalate is singularly clean and free from stain.

Other forms of alkaline development have come into very strong favour of late, and consists in the substitution of the carbonates of soda and potash, for ammonia in conjunction with pyro. In behaviour, they do not differ from ammonia, and formulæ for their use will be found in the appendix.

Frilling.—Nothing has yet been said of accidents in development, but there is one trouble which, though far less frequent now than formerly, may occasionally arise in hot weather. This is known as "frilling," and consists of a swelling and puckering of the gelatine film, which frequently separates itself almost entirely from the plate. The remedy for this is to plunge the plate, immediately the symptoms are seen, into a saturated solution of common alum. Frilling does not frequently exhibit itself during development, but usually after fixing and during washing; many operators, therefore, make a constant practice of using the alum bath before fixing, in order to harden the film, and enable it the better to withstand the trying ordeal. The plate should be well washed after leaving the alum bath and before fixing.

Fixing.—The "fixing," or removal of the unaltered

bromide of silver from the film, is performed with a solution of hyposulphite of soda, commonly known as "hypo." Take

Hyposulphite of Soda	1 lb.
Water	1 quart.

This is better made and kept in quantity. After solution, stir in a little solution of carbonate of soda until red litmus paper has its blue colour just restored. Filter before use.

The plate is immersed in this solution until, when viewed from the back, the white unaltered silver bromide has disappeared. It is then returned to the solution for two or three minutes longer, to ensure the thorough conversion of a partially soluble double salt, formed during the operation. Many workers employ a second bath of fresh hypo, which is a good plan, though not absolutely necessary.

Washing.—Too much stress cannot be laid upon the importance of careful washing after fixing, as upon this depends entirely the stability of the negative, and also its fitness for any subsequent treatment such as cleaning, intensifying, or reducing. After coming from the fixing bath, the negative should be washed back and front under the tap for a minute or two, and any emulsion removed from the back; it is then placed in the grooved washing tank, and left for at least three or four hours in a slowly but constantly changing stream of water.

Clearing.—This term is applied to the removal of the yellow stain caused by decomposition of the pyro; it may also be applied to the removal of the deposit of oxalate of lime, as mentioned under the ferrous oxalate developer.

For the removal of the pyro stain the following solution is used:—

Saturated Solution of Alum	20 oz.
Hydrochloric Acid (commercial) ...	1 oz.

Immerse the negative for a minute or two and wash thoroughly.

Intensification.—It frequently happens after fixing a negative, that its density is found to have been misjudged, and it requires either intensification or reduction. In either case, the entire removal of the fixing solution must be ensured; and though this is better done by *thorough washing* alone, the alum or clearing solution is often resorted to to make assurance doubly sure, but this, again, must be effectively removed. A simple means of intensification is as follows:—

No. 1.

Bichloride of Mercury	1 oz.
Water	20 oz.

No. 2.

Solution of Ammonia, s.g. ·890 ...	1 dr.
Water	5 oz.

Immerse the negative in No. 1 until it is almost white, and wash very thoroughly for a couple of minutes under the tap, followed by at least half-an-hour's soaking in several changes of fresh water. Then plunge into No. 2 until completely and evenly darkened, and finally wash well.

Reducing.—If the negative is too dense it may be reduced in a variety of ways. If it presents harsh contrasts, being dense in the lights and clear in the shadows, bleaching with the solution of bichloride of mercury, given under *intensification*, will improve matters.

If it be generally over-dense in lights and shadows alike, make the following solutions:—

No. 1.

Ferricyanide of Potassium	20 gr.
Water	1 oz.

No. 2.

Hyposulphite of Soda	20 gr.
Water	1 oz.

At the time of use, add a few drops of each of the above to sufficient water to well cover the plate. Immerse the negative, and keep the dish in motion until the requisite reduction is secured. Finish by thorough washing.

Drying and Finishing.—When all the wet operations are finished, the negative should be held under a gentle stream of water from the tap, and its surface gently rubbed with a soft pad of cotton wool, to dislodge any particle of dust or fibre that may have become attached to it. It should then be reared up to drain and dry in a warm place, free from dust, and resting on clean blotting paper, with the film side to the wall. The drying will be slower in this manner, but there will be less risk of chance dust falling on the film. On no account must heat be applied. If a negative is required to be dried in a hurry, flow a drachm or two of methylated alcohol over the surface to remove the water, and then immerse it for a minute or two in a dish of the same. It will then dry in a few minutes. When apparently quite dry, heat the negative as hot as the hand can comfortably bear, and store in a dry place.

Varnishing.—A negative should never be allowed to go into use for printing without being provided with a protective coating of some sort. If a trial print be required before varnishing, the greatest care must be observed that

both the negative and the sensitive paper are perfectly dry, otherwise the film will be stained by contact with the silvered surface. A very favourite protective coating for gelatine plates is collodion, which adds a toughness to the surface and forms a partial protection against damp. Moreover, it permits the negative to become damp without cracking, as is so often the case with varnish. MAWSON & SWAN'S Enamel Collodion is peculiarly suitable to this purpose. To withstand hard wear a coating of varnish is, however, necessary, and this may be used either with or without the preliminary layer of collodion. MAWSON & SWAN'S Dry Plate Varnish is specially prepared to meet the requirements of gelatine plates, and will be found to give a smooth, hard surface, not liable to either crack or scratch. To use it, let the plate be thoroughly dry, and warmed to a temperature that the hand can comfortably bear. Dust the plate very carefully, and having seen that the varnish is quite free from sediment or floating particles, pour a pool of it into the centre of the negative. Incline the glass so as to make the varnish flow into each corner in succession, and pour the surplus back into the bottle. Rock the plate gently from side to side, taking care to keep the corner from which the varnish was poured off lowermost, before a clear fire, and after the varnish has set with an even surface, heat the plate as hot as possible, for some minutes, to thoroughly harden it.

Should the varnish require to be removed at any time, let the plate be soaked for some time in methylated spirit, after which the softened varnish may be removed by means of friction, with a tuft of cotton wool. A little caustic alkali added to the alcohol will hasten matters. Afterwards soak in fresh alcohol, and finally wash in water.

Retouching.—If the negative require retouching, it

may be done by means of the pencil, either before or after varnishing. If before, the film must be perfectly dry and hard, to ensure which the negative should be heated immediately before the application of the pencil. To a skilled retoucher, the bare gelatine film affords a very convenient surface to work upon, but many prefer the varnished film. In this case MAWSON & SWAN'S Retouching Varnish may be used, or the surface of the Dry Plate Varnish may be prepared with their Retouching Medium.

Characteristics of the different Plates.—In the "Mawson" plate the manufacturers place before the public a plate which they believe to be unsurpassed by any in the market in a single quality that goes to make a perfect plate. It is *extremely sensitive*, easy to work, and gives an image which should please the most fastidious, while in freedom from mechanical faults all that human foresight, aided by elaborate machinery, can do has been done. The "Castle" plate, though cheaper, is prepared with equal care, and from the same quality of materials; the difference being that it is not so rapid as the "Mawson" plate, and, therefore, not so well suited for instantaneous work, though in a good light and with a suitable lens it is sufficiently sensitive for this purpose. The "Photo-mechanical" plate is specially prepared for use in connection with photo-mechanical printing processes, when great density combined with absolute clearness of lines is essential. The "Lantern" plate and the "Opal" plate are also special preparations with the specific object their names imply, and have been brought, after a vast deal of experiment, to the highest degree of perfection in their particular lines.

CHAPTER IV.

THE GELATINO-BROMIDE PAPER PROCESS.

The treatment of gelatino-bromide paper negatives does not differ materially from that of glass, except in so far as the altered nature of the support necessitates. The sensitive coating is in both cases identical, and though it has been stated that emulsion spread upon paper is more rapid than when glass is the support, the claim requires corroboration. In the following few pages we shall indicate briefly the chief points of difference between the treatment of glass and paper.

Roll Holders and Film Carriers.—The first difference we meet with is in the mode of carrying the sensitive films. Here the ordinary double slides, available for glass, are unsuitable, unless supplemented by some means of keeping the paper flat; but the choice of inventors appears to lie in favour of "special holders," which carry a large number of exposures in the form of a continuous band or roll of sensitive paper. These are ingenious in construction and undoubtedly convenient, and, in comparison with the number of exposures they carry, compact and portable. But their complexity necessarily involves a certain amount of care and anxiety for which reason many operators of paper will prefer the simpler

film carrier. This is an arrangement in various forms by which cut sheets of paper are held flat in the ordinary dark slides, which remain equally available for use with glass. The beginner in photography who desires to use paper films will do well to study the various holders and carriers advertised before making his selection.

Development.—So far as the operation of development is concerned, the treatment as well as the solutions are precisely similar in a general way to those employed for glass. The first variation consists in the preliminary soaking of the exposed paper in water before developing; this scarcely amounts to a differenee, since it *may* be adopted in connection with glass, but is absolutely necessary with paper, in consequence of the tendency of the latter to curl up when moistened. The paper negative is therefore immersed in water before development, until it lies perfectly flat, after which the developing solution is applied in the ordinary manner. Beyond a slightly greater liability to the formation of air bubbles, the operation itself presents no feature of difference, but if the back of the paper be pressed in contact with the bottom of the developing tray, this difficulty is reduced to a minimum.

With some brands of paper it is needful to carry the development to an apparently greater depth than with glass, as the backing of paper gives a false idea of the actual strength of the negative, especially before fixing. With other brands, on the contrary, an apparently thin negative will give a vigorous print. These differences must be learnt by experience.

The clearing solution, as given amongst the formulæ, must be used between developing and washing.

Fixing.—After very thorough washing, to remove as

far as possible all traces of the developing solution, the paper negative is immersed in the solution of hypo, which should be weaker than that for glass. It is important also that it be not used for too many negatives, so as to become discoloured, otherwise the paper support will be stained, the brilliancy of the negative destroyed, and the time required in printing increased. It will be found more difficult to judge when the paper negative is properly fixed than in the case of glass, as the opacity of the paper hides the progress of the fixing action; but if a quarter-of-an-hour or twenty minutes be allowed, or until the image is clearly though faintly seen by reflected light at the back of the paper, the negative may be safely considered as fixed.

Washing.—This operation is of quite as great importance with paper as with glass, but it is more easily and rapidly performed, owing to the fact that the water has access to both sides of the film. The operation may be hastened, too, without destroying its efficiency, by laying the negative face downwards upon a sheet of glass with a sheet of clean paper or India-rubber cloth overlaid, and passing a squeegee a few times over the whole, so as to squeeze out as much of the water from the pores of the paper and film as possible. If this be repeated three or four times at intervals of five or ten minutes, during which the negative is soaking in clean water, the washing will be efficiently performed.

Clearing, &c.—No matter what developer is used, nor how quickly it may be performed, it is almost certain to slightly stain the paper support. To remove this discolouration the negative is immersed in the clearing solution of alum and hydrochloric acid (see page 81) until the desired object is attained; this answers equally well for pyro or iron stain, and, besides, tends to harden the film.

Drying.—Special measures must be taken to ensure the flatness or rather freedom from creases and wrinkles of the dried negatives. If allowed to dry in the ordinary manner, and especially if of large size, the negative will be twisted and distorted to such an extent that it will be impossible to get it to lie flat, even under pressure. The application of a hot smoothing iron is useless, unless the paper be damped, and that is impracticable on account of the gelatine surface. But if the wet negative be laid face downwards upon a sheet of glass, or of polished ebonite, a little larger than itself, and pressed into intimate contact by means of the squeegee already referred to, it may, when dry, be stripped off in a perfectly flat state. The glass must, however, receive a preliminary preparation, to prevent its adhesion to the gelatine surface; this consists in rubbing it well with powdered French chalk, the excess of which is carefully polished off. The squeegee consists of a strip of moderately stout India-rubber, fastened between two pieces of wood, so as to leave a projecting tongue; and is used by passing it firmly over the back of the negative, so as to squeeze out all air and moisture from between it and the glass or ebonite.

Retouching.—If the negative require any improvement in the way of retouching, now is the time to perform it, as the paper support offers a beautiful surface for the pencil to work upon. The negative should be laid face downwards upon the retouching desk, and the pencil applied to the back.

Rendering the Negative Translucent.—The negative can be printed from in its present condition, though the operation will be lengthened owing to the opacity of the paper. It is usual, therefore, to impregnate the pores of the paper with some substance which will

render it translucent, or nearly transparent, and so lessen its retarding power, while, at the same time, destroying its apparent texture. For this purpose, castor oil, wax, and vaseline have been employed, but the most useful is the preparation known as "oil vaseline." This is smeared over the back of the negative and allowed some hours to penetrate, after which the excess is carefully wiped off. A gentle heat will expedite the penetration, and leave the paper almost transparent. Any of the greasy matter that may get on to the surface of the negative should be cleaned off with benzole or spirits of turpentine. The finished negative should be preserved in a portfolio, the leaves of which have been saturated with wax or vaseline, in the same manner as the negative; this will keep them clean and prevent the drying out of the vaseline.

Stripping Films.—A new kind of film has recently been placed upon the market, under the name of "Stripping Films," and consists of a hardened film of sensitive gelatine spread upon paper, with an intervening layer of soluble gelatine; the paper, however, is only used as the temporary support. The negative is exposed and developed in the ordinary manner, and then "squeegeed" on to glass previously prepared with a substratum of India-rubber and a coating of collodion. It is then immersed in warm water, when the intervening layer of soluble gelatine dissolves and the paper support comes away. A thick skin of prepared gelatine—sold for the purpose—is next squeegeed on to the negative, and finally, when dry, it is stripped from the glass and forms a transparent "film" negative, free from grain or texture, which can be printed from either side. Fuller working instructions are supplied by the manufacturers with the films.

PART III.

THE PRINT.

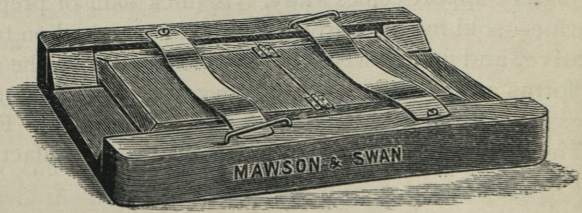
CHAPTER I.

SILVER PRINTING ON ALBUMENISED PAPER.

Of the various methods of printing at present in vogue, the oldest, and undoubtedly the one most generally employed, is the silver printing process on albumenised paper. Succeeding the older methods of printing in silver upon plain or matt paper, the adoption of the albumen surface added greatly, not only to the beauty of tone obtainable, but also the depth and brilliancy of the prints; and, since its introduction, this process, despite the many attacks made upon its character for permanency, and, notwithstanding the entry into the field of many rival methods, still retains the pre-eminent position.

Apparatus and Materials. — The following additional appliances will be required in the printing room:—

First, are the printing frames which are made in two



forms; the first a light frame of teak or pine, the size of

the negative used, and fitted with a hinged back and brass springs to secure pressure of the paper in contact with the negative. The back-board of the frame is divided into two portions, each of which is acted upon by a spring, so that by opening one half the progress of the print can be inspected, whilst the other half holds the paper firmly in position and prevents its "losing register." This form is adapted for the smaller sizes. The second form is of stouter construction, usually of oak or mahogany, and fitted with plate glass front; the pressure is obtained by means of wooden thumbscrews, working through hinged bars at the back of the frame. These, from their stronger construction, are more suitable for the larger sizes of negatives, though, in consequence of the permanent glass front, the smallest plates may be employed.

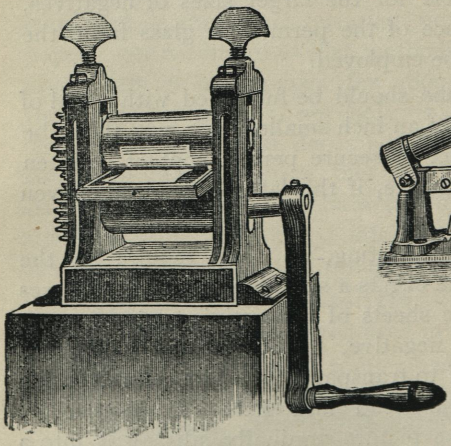
The printing frame should be furnished with a pad of felt, about an eighth of an inch smaller each way than the pressure-back, in order to secure perfect contact between the print and the negative, if the latter should be uneven in surface.

In the course of printing, we shall require for the production of vignette effects a selection of vignette glasses or papers; these are sheets of non-actinic glass or paper of the size of the negative, the centres of which are gradually shaded off to transparency. The centre portion of the negative—the head and bust—is consequently printed out, while the picture gradually falls away into a white margin, where the opaque portions of the vignetting screen intervenes.

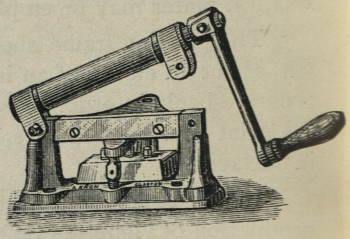
For printing portraits with white, tinted, or black sharply defined borders, masks and discs of opaque paper are supplied in different shapes and sizes; they are placed between the negatives and the sensitive paper.

For trimming the finished prints, glass cutting shapes are employed; these are pieces of glass cut to the required size, and their edges carefully ground to act as cutting guides; they may be used either with a penknife or scissors. A very convenient tool for cutting prints is the American print trimmer, a revolving sharpened wheel fixed in a handle after the manner of cheap glass cutters. This must be used with guides or shapes consisting of an aperture cut in thin metal.

For finishing the print after mounting, it is subjected to either rolling or burnishing. In the first, heavy pressure is applied by means of a roller to the back of the mount, the



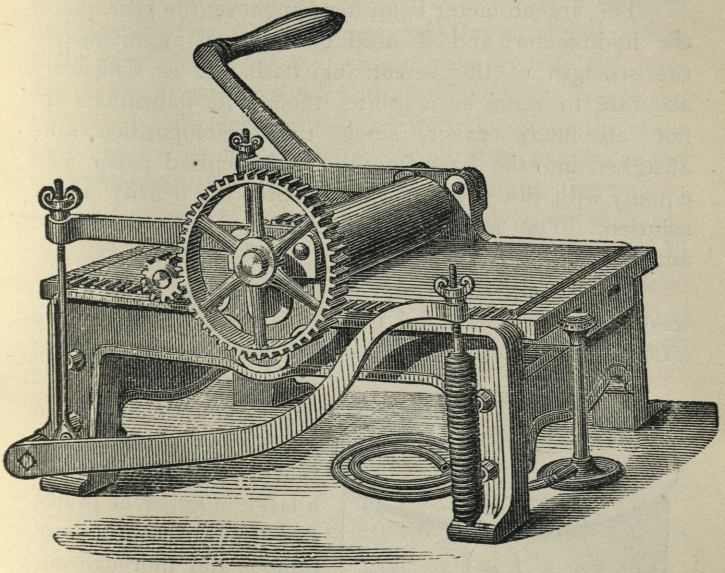
(Fig. 1.)



(Fig. 3.)

surface of the print being in contact with a highly polished steel plate. A useful form of rolling press for small prints up to half-plate size is shown in the first figure (1), and a more elaborate pattern adapted to larger sizes is represented in the double-geared machine shown in figure (2).

In the burnisher a frictional pressure is given by imparting a zigzag motion either to the print or the burnishing bar. The latter gives the highest finish to the surface. This is provided with an arrangement by means of which the plate can be heated in order to impart a higher gloss to the print. The burnishing machine is shown in the diagram (3), the



(Fig. 2.)

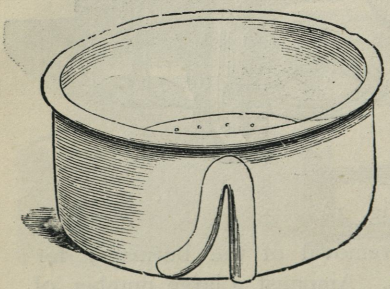
roller being open for the removal of the burnisher for cleaning or other purposes. Amongst a large number of burnishers MAWSON & SWAN can confidently recommend this as being strong and well-made, of perfect finish, and thoroughly efficient in every way.

A number of porcelain dishes will be required for sensitising, washing, toning, and fixing, each of which

should be kept for its special purpose. A pair of horn or ebonite forceps will be useful for lifting the paper from the sensitising bath, in order to avoid staining the fingers; wood or glass clips are employed to suspend the paper after sensitising, though black enamelled pins answer equally well.

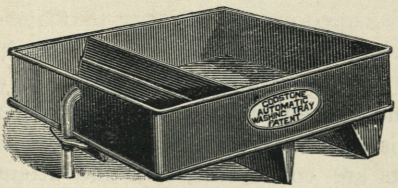
The argentometer is an instrument on the principle of the hydrometer, and is used to ascertain approximately the strength of the sensitising bath. It is sufficiently accurate to serve as a guide, though its indications are not absolutely exact, since the decomposition salts absorbed into the bath from the albumenised paper tend equally with the silver nitrate to alter the density of the solution. The more correct method is by volumetric analysis.

A very important item in the printing outfit is the washing trough, as upon the care exercised in the due washing of the print after fixing depends in a very great measure its permanency. The requirements of a good washing trough are, that it shall accommodate a large number of prints, and by ensuring a continuous and thorough circulation of the water, effect the complete and uniform elimination of the fixing salt. These ends are very satisfactorily attained in MAWSON & SWAN'S Syphon Washing Trough, which consists of a circular porcelain vessel, fitted with a perforated false bottom, and having a syphon overflow tube moulded into its side. Upon leading a stream of



water from the tap into the vessel, it gradually fills, and if the water be directed at a suitable angle, the prints are kept in constant motion. Upon reaching the level of the bend of the syphon, the water commences to overflow, and according to the force of the inflowing stream, the character of the washing may be varied at will. Thus, if the inflow be so adjusted as to be about equal to the capacity of the syphon to carry off, the water will remain at the same level, a constant change taking place, the overflow being drawn from the bottom of the vessel where the eliminated salts descend by gravitation. If, on the other hand, the inflow be less than the outflow, as soon as the vessel becomes full, it commences to empty, the syphon carrying away the contents more rapidly than they are replaced, and this continues until the vessel is empty, and the syphon ceases to act, when it again fills. It will also be noted that, for a short time, while the last portion of the water is draining away, the prints lie exposed upon the perforated false bottom, and then receive the direct stream of fresh water from the tap. In this manner the prints are subjected to an alternate soaking and draining, the relative duration of each of which can be regulated by means of the tap.

For small numbers of prints the "Godstone Automatic



Washing Tray" shown in the figure is useful. It is a balanced tray, divided into two compartments, and so

arranged that when the water reaches a certain level, the tray is tilted, and a syphon set in action, which empties it and permits it to resume its original position, thus causing a constant change of water. Other forms of washing troughs will be found in MAWSON & SWAN'S illustrated catalogue.

The following materials and chemicals will be required in this department:—Albumenised or Ready Sensitised paper, nitrate of silver, chloride of gold, carbonate of soda, acetate of soda, borax, hyposulphite of soda, common salt, and liquor ammonia. Also mounts and mounting medium, which may consist of starch-paste, or fine glue, but MAWSON & SWAN'S Mounting Medium is recommended as superior to either as it does not warp or cockle the mount.

Sensitising the Paper. — We are now ready to proceed with the printing operations, and the first step is to sensitise the paper. The albumenised paper should be kept in a dry place, though it is not necessary nor desirable to absolutely desiccate it. If kept in a cylindrical tin case supplied for the purpose, and of a size to take the full sheet of paper all will be right. A smaller case will be useful for holding cut sheets or prints previous to toning.

Unless very large prints are required, it is not advisable to sensitise whole sheets of paper, nor is it on the other hand convenient to cut up the paper too small before sensitising. For carte de visite and larger sizes, quarter sheets are convenient, but due attention should always be paid to the way the paper will cut, so as to avoid waste. Having decided upon the size of the paper, select a dish not less than an inch larger each way, and

pour into it the following solution to the depth of half-an-inch.

Sensitising Solution.

Nitrate of Silver	600 gr.
Distilled Water	10 fluid oz.

The solution must be carefully filtered, and if there be any dust or scum floating on the surface, it must be removed by means of a strip of blotting paper.

Now take the sheet of paper cut to size, and holding it with thumbs and fingers by opposite corners diagonally, spring it into a bow with the albumenised or glazed side downwards. Next, bring the centre of the sheet into contact with the sensitising solution, and rapidly and dexterously lower each of the corners in such a manner as to drive away any air bubbles, and leave the paper floating on the surface of the solution. With a little practice this is easily and quickly executed. At first, and especially if the paper has been very dry, it will curl up backwards from the solution; by breathing upon it the tendency to curl is overcome, but if very obstinate, the corners must be gently pressed and held down with the fingers until they lie flat, taking care not to force the sheet below the surface, and so get the solution on the back. After a minute or so, or when the paper lies flat, raise it by one corner with the horn forceps, and draw the albumen surface over the edge of the dish or a glass rod so as to sweep off any minute air bubbles that may be attached to the surface, and which would inevitably leave a mark if allowed to remain; then return it to the dish and allow it to float for a total period of two minutes, or in winter, three. When fully sensitised, again raise it by one corner, and holding it over the dish, pass the glass rod three or four times downwards over its whole surface

so as to drive off as much as possible of the adherent solution, then hang it up to dry, pressing a small square of blotting paper in contact with the lower corner in order to catch the last drops of solution. Carefully preserve these scraps of blotting paper, and any others used for skimming the bath or wiping up spilt silver solution, as the silver they contain can be recovered. To dry the paper, a convenient plan is to stretch a stout cord across the room to which the sheets of paper are hung by means of American or glass clips, or black pins, the latter being recommended because the enamel prevents any action upon the silvered solution. When dry the paper will curl up tightly with its sensitive side inwards; but before placing it in the printing frame or in the store case, it is a good plan to thoroughly desiccate it by holding it at a short distance from a clear fire until it ceases to give off steam. This will not only cause it to keep longer, but will also prevent its staining the negative; care must, however, be taken not to discolour it by too great heat. Some little time also should be allowed to elapse between thus drying the paper and placing it in the printing frame, as if pressure be placed upon it before it has resumed the normal temperature and condition of the atmosphere, it will expand and cockle in contact with the negative, and destroy the definition of the print. If thoroughly dried and placed at once in the preservative case, it will keep for some days in cool weather, but only for a few hours in the heat of summer. It is always better, however, to use it as soon as possible. The surface of the paper should be handled as little as possible in cutting it to size.

The bath should be carefully filtered each time before use, otherwise the surface of the paper will be covered

with unsightly markings after sensitising. The best method to adopt is to provide the stock bottle with a glass funnel instead of a cork, and to place a folded filter paper or a plug of "glass wool" in the funnel. After each day's use the bath solution is poured back into the funnel, and is filtered clear into the bottle and ready for use when wanted. The filtering medium need not be renewed until it refuses to act further, when it should be added to the "residues."

In course of use the bath becomes discoloured, in time acquiring a deep brown hue. When this occurs it should be shaken up with a small quantity of kaolin or "china-clay," allowed to settle and filtered. Or a pinch or two of carbonate of soda are added until a permanent precipitate remains, when the bottle is placed in daylight—sunshine preferably—for a few hours until the black sediment settles and leaves the supernatant solution colourless.

Before taking the bath into use again it is to be tested for alkalinity, and rendered just neutral by means of nitric acid. Its strength should also be tested and brought up to the normal sixty grains to the ounce.

Cutting the Paper.—A few hints on the subject of cutting the paper to size may be useful. The dimensions of the full sheet of paper are usually 22½ inches by 17½, a size which cuts up very badly for some negatives. For carte de visite size, thirty-two prints may be made out of the sheet by simply doubling it upon itself five times in alternate directions, or, what will make a neater job of it, three times *across* the longer dimensions, and twice across the shorter. This, however, is a needlessly wasteful method, since a large quantity of paper is cut away in trimming. But, by adopting the following plan, forty-two

cartes may be obtained out of a sheet, and if cut to the exact size at once will save the trouble of further trimming. If the sheet be cut into six strips the long way of the paper, and these be again divided into seven, we shall have forty-two sections, each measuring $3\frac{3}{4} \times 2\frac{1}{2}$, that is, supposing the sheet to be fully the size we have named, which is not always the case. But these will be much too large, and will require trimming down. As the sheet of paper, even if of full size, is never utilisable to the edges, we shall gain in every way by cutting it up to exact size at first, as we can then reject the frayed and defective edges, and still cut up to forty-two prints. Let the size of the cut print be $3\frac{1}{2} \times 2\frac{1}{4}$, which is quite large enough for any carte mount, even if not printed with a line; this will give a total area used of $21 \times 15\frac{3}{4}$, which allows a margin of three-quarters-of-an-inch to be cut off all round the sheet. Procuring a straight edge, and a sheet of glass about 20×10 inches as a cutting board, we first clear off the defective edge from one of the shorter sides of the sheet, and then proceed to cut it into six strips three-and-a-half-inch wide, and these are again sub-divided by means of a cutting shape two-and-a-quarter inches wide, again rejecting the defective ends. In like manner, whatever may be the size of the negative, a little calculation will show how the paper may be cut to the best advantage, and for all but large sizes we counsel the practice of trimming at once to the required size, as both time and material are thus saved. The larger sizes are more liable to get frayed at the edges in handling during toning, fixing, and washing, hence we prefer to leave in such instances a small margin for trimming.

In all cases let the cuttings of sensitised paper, whether before or after printing, be carefully preserved, in

order that the silver may be recovered, either by the amateur himself or by the professional refiner.

Printing.—The paper having been sensitised, dried, and cut to size is ready for the printing frame. The negative is first carefully dusted and laid, varnished side upwards, in the frame, and a piece of sensitive paper placed in contact with it, a sheet of clean blotting paper and a felt pad being laid over it, and finally the hinged back of the frame and the springs fastened down. Incline the frame at an angle of about 45° to a clear sky, avoiding direct sunshine except for very dense negatives. For very thin negatives a sheet of tissue paper or ground glass may be with advantage laid over the negative. Inspect the progress of the printing at frequent intervals by opening one half of the hinged back, taking care that in closing it and refixing the spring the relative positions of the negative and print are not changed. Carry the printing a little deeper than required in the finished print as the subsequent operations reduce the strength somewhat.

A good deal of skill may be exercised in what is called "dodging" the printing, as, for instance, in shading portions of a negative that are thinner than the rest in order to prevent their becoming over-done. The sky, too, frequently prints dark and is better for shading, or clouds have to be printed in from a separate negative; but the tyro will learn these operations better by practical demonstration than we can offer to teach him in the brief space at our disposal in this little *brochure*. We mention the matter here, however, to point out what he will have to prepare for as he becomes proficient.

In vignetting—a practice almost wholly confined to portraiture, though extremely artistic effects in landscape may be secured by its means—sunlight is quite inadmissible,

except under the conditions we shall name. Every effort must be made to secure softness of gradation, and even with a well graduated vignette glass or paper the penetrating power of sunlight is so great that the gradation is often spoilt. Where a vignetting mask with serrated edge is used, the very essence of the process lies in the employment of a light softened to the utmost extent by every available means. The mask must be placed at a certain distance from the negative, and must then be covered with a translucent medium to still further soften the shadow it casts upon the negative. Many of the best vignette artists add to the softness of their results by keeping the negative in rotary motion during exposure. This may be conveniently done by suspending a square board by its corners from an ordinary roasting-jack, and placing the printing frames upon the revolving stage so formed. By placing an oval or other suitable shaped mask over the negative at a distance of half-an-inch, and covering it with a small piece of ground glass, vignettes of the most perfect softness may be thus obtained.

After removal from the printing frame the print should be at once placed in the tin preservative case, or else in a portfolio, and should be toned as early as possible. This is usually done at the close of each day's work.

Toning and Fixing.—Before toning, the print must be thoroughly washed, to remove the free soluble nitrate of silver it contains, and upon the completeness of its elimination depends, to some extent, the beauty and stability of the tone obtained. Upon immersion in water, the purple brown tone of the print, as it leaves the frame, becomes much redder, frequently of a bright brick red, and the water becomes milky, from the formation of insoluble

chloride and carbonate of silver. The prints should first be allowed to soak for some minutes in a comparatively small quantity of water, which must be poured away and preserved, as it contains a large proportion of silver; a second quantity is used to replace it, and the prints are thoroughly turned over in this for a few minutes, and it is then added to the first. Succeeding changes of water do not contain sufficient silver to be worth saving, but the prints must be washed until no further milkiness is imparted to the water when changed; they are then ready for toning. The toning bath consists of a solution of chloride of gold, rendered neutral or slightly alkaline shortly before use, and may be prepared and kept in the following stock solutions.

TONING SOLUTION.

No. 1.

Powdered Borax	6 drachms.
Acetate of Soda	3 ,,
Bicarbonate of Soda	1½ ,,
Distilled or Rain Water	80 oz.

No. 2.

Chloride of Gold	15 gr.
Water	15 oz.

Mix two hours before use in the proportion of five ounces of No. 1 to one ounce of No. 2, and this quantity will be sufficient to tone a full sheet of paper.

The prints after thorough washing are plunged two or three at a time into the toning solution, and kept constantly in motion to ensure uniform action. The change takes place slowly at the ordinary temperature, but gradually the red colour changes, passing through various stages of duller red, brown, purple, purple-black, to slaty-blue. The action must be arrested when the desired stage is reached, but

only experience can teach the exact point since the tone is usually slightly altered in fixing and drying. A very wide range of pleasing tones are, however, obtained with this bath, so that little difficulty need be experienced on this score. In cold weather the toning may be accelerated by slightly warming the bath, but in summer more uniform results are obtained by using it cold.

After once using, the toning bath may be kept and strengthened up by the addition of fresh quantities of stock solutions when again required for use, bearing in mind that one grain of gold, or one ounce of stock solution—No. 2—is required for each sheet of paper toned. It is not necessary to add No. 1 in the same proportion each time.

When the prints are sufficiently toned they are removed to a dish of clean water to arrest further action, and there allowed to remain until the whole batch is finished. Then, and not till then, proceed to mix the fixing bath. This must be rigourously kept clear of the prints until after they are toned, and especially while they contain free silver, or stains and uneven toning will be inevitable. No worse practice can be followed than to have prints toning and fixing simultaneously, as in handling them traces of one solution are sure to get mixed with the other.

The fixing bath is composed of

Hyposulphite of Soda	4 oz.
Water	1 pint.

Dissolve the hypo in *hot* water, otherwise the temperature of the solution will be reduced to such a degree that it will be unfit for use for some time. The bath may be used warm, and the prints must be kept in motion in it for a period of a quarter-of-an-hour or twenty minutes. If allowed to

mat together in a heap they will be imperfectly fixed and subject to subsequent fading and discolouration. Upon immersion in the fixing bath the tone of the prints will at first change, becoming much redder, but the original tone will gradually return. If such be not the case a slightly weaker fixing bath may be used, or it is a sign that the prints have not been sufficiently washed before toning.

After fixing, the prints are again removed to a dish of clean water, in which they are turned over singly, the water changed, and the operation repeated. A still better plan is to take each print singly, and sponge it over back and front upon a sheet of glass, while a gentle stream of water runs on to it from the tap. In this manner the bulk of the fixing salt is removed before the print goes into the washing apparatus.

The washing must be continued for some hours, the time depending upon the method or the means adopted, always bearing in mind that the quicker the washing the less will the brilliancy of the print be interfered with. With the apparatus described, three or four hours will be sufficient, but if washed in an ordinary dish or pan the water should be changed every hour, for at least eight or ten, but a better plan is to allow a gentle stream to run in continually.

Ready Sensitised Paper.—Most amateurs now prefer to employ the "ready sensitised" papers, which for their purposes are specially convenient, as they enable a few prints to be made at any odd moments when time permits, without the trouble of sensitising. The prints will also keep some time before toning, and the amateur is thus again enabled to utilise his chance spare moments to the best advantage.

MAWSON & SWAN'S Extra-brilliant Sensitised Paper is specially adapted to the amateur's requirements, as it will keep for months if protected from light and damp; it may be kept under pressure in the flat state, or rolled up in a tin case as already described. The best preservative is a sheet of the sensitised paper itself, and if a piece just large enough to surround the roll be retained for that special purpose, it will effect a considerable saving, as the outer layer of paper invariably discolours in a very short time.

There is very little difference in the treatment necessary for ready-sensitised paper from that already described. The prints should be well washed in at least four changes of water, a tea-spoonful of carbonate of soda being dissolved in the third water to neutralise the natural acidity of the paper. Carry the printing only a little deeper than required. The toning may be performed in the bath we have already given, or the following may be employed:—

Acetate of Soda	20 gr.
Chloride of Gold	1 gr.
Water	8 oz.

Prepare at least twenty-four hours before use, and as it improves by keeping, a stock of it may be prepared in concentrated form, thus:—

Acetate of Soda	300 gr.
Chloride of Gold	15 gr.
Water	15 oz.

One ounce of this is diluted with seven ounces of water for use, the loss of strength in toning being made up from the stock solution.

Fix in solution of hypo, not stronger than three ounces to the pint of water, and wash as already described.

Drying, Trimming, and Mounting the Prints.—When sufficiently washed the prints are placed between sheets of clean blotting paper, which should be kept for that purpose alone. If already trimmed to size they may be left between the blotting paper until required for mounting, and they will then give less trouble from curling. If, however, they have to be trimmed it will be necessary to dry them, otherwise the edges will not be cut clean.

The trimming is performed by laying the print face upwards on a sheet of plate glass or polished zinc; then by means of a print trimmer already described, and a glass or metal cutting shape, the rough edges are removed, and the print reduced to the size required. It must be borne in mind, in selecting the size of the cutting shape, that the print will expand slightly when damped for mounting, and allowance must therefore be made. The knife or trimmer must be kept sharp, and the glass or metal guide must be pressed firmly on the print, or ragged, uneven edges will result.

The mounting material, whether starch, glue, or MAWSON & SWAN'S special "Medium," is applied to the back of the print with a small piece of sponge and rubbed evenly in; if the print be dry the mountant must be allowed to soak in until the paper becomes quite limp and lies perfectly flat. It is then raised carefully, and without touching the edges, which are very apt to become dry and refuse to adhere, it is placed in position on the mount, and a sheet of clean blotting paper having been placed over it, it is rubbed down into contact with an ivory or bone paper knife, gentle pressure being applied at first and gradually increased. The surface of the print may perhaps appear uneven while still damp, and show the sponge marks or those of the paper knife in rubbing down, but these will

disappear when dry. If any of the mountant should have got on to the front of the print, as is very likely, it is removed with a soft sponge and warm water. The mounted prints should now be placed under pressure between clean *dry* blotting paper until quite dry; this will in a great measure prevent their curling or cockling.

Rolling and Burnishing the Prints.—The prints, though now completed, do not possess the finished appearance we are accustomed to see in professional work. This is applied by means of the rolling press or burnisher already described, which gives to the print a smooth and more or less glossy finish. Many operators effect a partial result by using a preparation known as Encaustic Paste, which is rubbed on the surface of the print with a piece of flannel. This gives a polish to the surface, and imparts great depth and brilliancy to the shadows.

The rolling press, especially with heat, gives a far smoother and more brilliant surface; the print is laid face downwards upon the polished steel plate, and passed backwards and forwards through the press a few times, the pressure being gradually increased by means of the screw or screws provided for the purpose.

The burnisher, however, gives the most perfect surface. The burnishing bar is first raised to a temperature of 170° or 180° by means of a spirit lamp placed underneath it; while this is going on, the prints, which must be perfectly dry, and quite free from dust, are taken singly, and their surfaces smeared over with a lubricating solution supplied for the purpose, and this again allowed to become quite dry, which it will do in a few minutes. They are then passed singly through the machine, backwards and forwards, the pressure, as in the former case, being gradually increased until a beautifully soft and glossy

surface is given. This treatment adds greatly also to the depth and richness of the shadows, rendering them clear and liquid, where previously they were perhaps dull and heavy.

If the surface of the prints should be abraded, it is evidence that they have not been dry, the lubricating solution has not been evenly applied or allowed to dry, or that the pressure has been applied too suddenly. If scratches appear on the surface they arise either from faults on the surface of the burnishing bar or more probably from dust. The remedy is obvious.

Enamelling the Prints.—A still more highly finished surface is given to the print by the process known as enamelling, in which the picture, before mounting, is cemented to a collodion film, spread upon plate glass, from which it is subsequently stripped when dry with the highly polished surface of the glass itself. The process is as follows:—

Take a sheet of plate glass, highly polished and free from scratches, clean it thoroughly, and polish with powdered talc. Dust carefully and coat with MAWSON'S Enamel Collodion, and set aside to dry in a place free from dust. Prepare a solution of good, clear gelatine of the strength of about forty grains to the ounce of water, and filter very carefully. When ready to proceed, take the prints, on the completion of the washing, and immerse them for a minute in the warm gelatine solution, then carefully, but rapidly, lay them down upon the collodionised glass previously warmed. A number of small prints may be laid upon a larger sheet of glass, but no larger number must be attempted than can be laid down before the gelatine sets. With a soft "squeegee" press the prints into intimate contact with the glass, and set aside to dry

spontaneously in a place scrupulously free from dust. When perfectly dry, the prints with the collodion film attached are ready to strip from the glass, but as the subsequent damping in the process of mounting would destroy the gloss, this course is not adopted. Instead, the prints are mounted while still in contact with the glass. To effect this, a sheet of thin cardboard is coated with the same gelatine solution already mentioned, and squeegeed into contact with the backs of the prints, the whole being placed under pressure until dry. When this occurs a sharp penknife is passed round the edges of the cardboard mount to detach it from the glass, and, one corner being raised, the whole is lifted from the plate, the mount bringing with it the print and collodion film, with a highly glazed surface. The separate prints are then trimmed to size in the ordinary manner.

It is needless to say, that in laying down the prints, a sufficient space should be left between them to admit of trimming with a proper margin. Half-a-dozen cartes, or two, three, or four cabinets, or half-plates may be mounted on one glass, but larger sizes are better treated singly.

Recovery of Residues.—Directions have been given for the saving of the washing water of prints and of the trimmings before toning, both of which contain large and recoverable quantities of silver. In the majority of cases the amateur will not care for the trouble of recovering the metal himself, but will prefer to send the residues to the refiner; but, under any circumstances, he will have to conduct the saving operations in a methodical and proper manner.

The washing of prints must be poured into a large jar or tub kept for the purpose, and this should be acidified with common commercial nitric or hydrochloric acid, and a

little salt added occasionally to throw down the chloride of silver. Avoid adding too much salt, or the precipitated chloride will be redissolved and wasted. Add, rather, a small quantity each time that fresh washings are poured into the jar and stir well, afterwards allowing the precipitate to settle. A pinch of salt added to the clear liquid will show if any silver remains in it; if free from silver it may be poured away. The chloride may be allowed to accumulate for months in this manner until there is a sufficient quantity to reduce or to send to the refiner. It must first be thoroughly dried.

The cuttings of prints are collected and saved in a bag or basket until sufficient have accumulated, when they should be burnt in a suitable receptacle of earthenware or metal placed under a flue, care being taken that the light ash is not drawn into the flue and lost. When burnt, the ash should be powdered and sifted and kept in a bottle or jar, and is very rich in silver.

The fixing solution for prints, after it has been once used, should not be again employed for that purpose, but may be applied to the fixing of plates if desired. When discoloured or saturated with silver it should be placed in a jar or other vessel with some clippings of zinc, when in the course of a day or two all the silver will be found reduced to the metallic state, and may be collected and dried.

These residues may be, when thoroughly dried, mixed together, and sent to the refiner, who will return their value in cash or nitrate of silver, less a small charge for reducing. Or they may be mixed with an equal weight each of dried carbonate of soda and carbonate of potash, and reduced in a crucible in a smith's forge or suitable furnace.

The recovery of the gold from used toning solutions is not worth undertaking if the toning bath is properly utilised.

CHAPTER II.

GELATINO-CHLORIDE & GELATINO-BROMIDE.

The nearest approach that has yet been made, in appearance at least, to the results produced upon albumenised paper, is by the gelatino-chloride process; prints by which, when well executed, are practically indistinguishable from those by the older and favourite method. When we add to this, that greater rapidity, as well as more assured permanency are claimed for these productions, sufficient has been said to show that gelatino-chloride is likely to become a popular process.

Gelatino-bromide, though quite unlike in its results those of albumen paper, is better adapted to the production of bold and vigorous prints of large size, and its great rapidity, at the same time, renders it specially useful for enlargements. The rich black tones and matt surface tend, in the eyes of the best judges, to render well-executed gelatino-bromide enlargements far more artistic productions, in their class, than those by any other process, while the nature of the surface affords every facility for finishing in black and white.

Gelatino-chloride papers are of two classes; those intended for direct printing or "printing out," and those

which are intended for development. The former are little more rapid than ordinary albumenised paper, and their general treatment is very similar. The latter may be used for contact printing, when their comparatively greater rapidity enables a large number of prints to be got off in a given time; and, as the exposure can be made to gas or other artificial light, the operator is practically independent of the weather. They may also be employed for enlargements, though, except when colour is an object, they are inferior, for this purpose, to gelatino-bromide; still, as by carefully adjusting the exposure, tones closely resembling albumenised prints can be obtained, gelatino-chloride paper finds favour with many.

Gelatino-chloride "Printing out" Paper.—The gelatino-chloride "printing out" paper is sold in the same manner as "ready sensitised" albumen paper, in sheets of similar dimensions, or cut to standard sizes ready for use. It differs merely from the albumen paper in being generally of a thicker character, and having a higher gloss. It keeps equally well, or perhaps retains its whiteness for a longer period, but requires greater care in handling, owing to the solubility and tenderness of the gelatine coating. The latter feature entirely precludes the possibility of using heat in any of the operations, and from the adhesive nature of its surface, the drying must be performed without the assistance of blotting paper. As compared with albumen paper, gelatino-chloride may, therefore, be said to labour under disadvantages, but the beauty of its results, especially when working from thin negatives, and the greater permanency they are alleged to possess, have gained it a footing.

The printing is performed precisely as in the case of albumen paper, only greater care must be exercised in

providing against damp. The printing should be carried only a little deeper than required, as the image is but slightly reduced in toning. The prints are washed before toning, but the thoroughness of the operation is not of such importance as with albumenised paper; one or two changes of water will suffice. The toning bath differs too, not only in its composition but also in its strength, a much larger proportion of gold being necessary with the gelatine paper, hence, perhaps, the greater permanency of the image. The following is the toning bath:—

No. 1.

Sulpho-cyanide of Ammonium	250 grs.
Hyposulphite of Soda	5 ,,
Water	20 oz.

No. 2.

Chloride of Gold...	15 grs.
Water	15 oz.

Mix for use, about an hour before required, one part of No. 2 with two parts of No. 1, pouring the former into the latter, and stirring well. The prints are immersed in this solution and kept in motion until the desired tone is obtained, the colour being judged by *looking through* the print, not upon its surface. Very fine cool black tones are obtained, as well as a great variety of browns. Fix in a solution of hypo two ounces to the pint of water, and wash very thoroughly after fixing Great care must be exercised throughout the whole of the operations not to damage the film which should not be handled too much, lest the warmth of the fingers cause it to soften or dissolve.

After thorough washing, the prints are immersed for a few minutes in a saturated solution of alum to harden the

gelatine; after a final washing they are ready for drying. This may be performed by laying each print singly face downwards on a sheet of plate glass, and passing a squeegee gently over the back, after which it is immediately stripped from the glass and hung up to dry; the surface will then be similar to albumenised paper, but it cannot readily be burnished without danger of injury. A favourite plan, by which a higher surface is obtained, is to squeegee the print into contact with glass or polished ebonite, previously polished with powdered talc, and to allow it to dry. Upon stripping the dried print it will present a surface similar to that produced by enamelling.

Gelatino-Chloride Paper for Development.—The gelatino-chloride paper for development is supplied in full sheets or cut sizes as well as in rolls, and must be preserved from access of light as carefully as dry plates. The great point in favour of the chloride paper is the wide range of tones obtainable, either by mere development or by development followed by toning. Little can be said here in the way of instructions on this point, beyond laying down the general axiom that the longer the exposure with a suitably restrained development the warmer will be the colour. Very long exposures (proportionally) will give bright red prints that may be toned with gold to produce various shades of purple; while extremely pleasing warm brown tones may be produced by development alone.

For direct printing in contact with a negative, an exposure varying from a second or two, according to circumstances, may be given either in weak daylight, or preferably to gas or lamp light. For enlargements, of course, all will depend upon the degree of amplification, the light, and the optical arrangements.

The development is carried out with the following solution:—

No. 1.

Saturated Solution Oxalate of Potash.

No. 2.

Saturated Solution Sulphate of Iron ...	½ oz.
Citric Acid	10 gr.
Water	3½ oz.

For use, mix the two solutions in equal proportions, pouring No. 2 into No. 1. Have at hand also a ten per cent. solution of bromide of potassium, and of this add to each two ounces of mixed developer, from half a drachm to two drachms according to the exposure given and the colour desired. The development should proceed with tolerable rapidity, and must be arrested as soon as the shadows show a tendency to become heavy. The print is then well washed, and immersed in a clearing solution composed of

Powdered Alum...	2 oz.
Citric Acid	½ oz.
Water	20 oz.

in which it must remain five minutes. After again washing proceed with the toning if required; the toning bath may be similar to those given for albumenised paper, with only one half the quantity of water; or that given for gelatino-chloride printing-out paper may be used. The fixing solution is hypo, two to three ounces to the pint of water. Wash carefully and hang up to dry spontaneously.

This paper does not require such extreme care in handling as the "printing-out" paper, but it must be

always borne in mind that it will not bear warm solutions or the application of heat in drying.

Gelatino-Bromide Paper.—The employment of gelatino-bromide paper is almost wholly confined to the production of enlargements, but we may describe its manipulation here rather than in the chapter devoted to the optical and mechanical phases of enlarging.

Under the head of THE NEGATIVE we have already spoken of the manipulation of gelatino-bromide *negative* paper, and the treatment to be accorded to MAWSON & SWAN'S New Bromide Paper for positives differ little from that detailed. The physical difference between a negative and a positive image only must be borne in mind, and we prefer to employ the iron developer. This for positive purposes is made as follows:—

No. 1.

Neutral Oxalate of Potash	20 oz.
Bromide of Potassium	40 grs.
Distilled Water	80 oz.

No. 2.

Sulphate of Iron	6 oz.
Sulphuric Acid	14 minims.
Distilled Water	18 oz.

Pour one part of No. 2 into seven parts of No. 1 immediately before using.

For contact printing the exposures are very short; we therefore prefer to use artificial light, giving from twenty seconds, at a distance of a yard from a gas flame. In enlarging, the exposure will vary from about ninety seconds, according to the intensity of the light, the density of the negative, and the degree of amplification. Under-exposure gives a harsh picture of bad colour; over-exposure, a

flat, feeble image, devoid alike of half-tones, lights or shadows.

After exposure, soak the print in plain water until perfectly limp; pour off the water, and, with the print lying face uppermost at the bottom of the dish, replace it with a sufficiency of the above developer, and keep it covered. Rock gently and watch the development, which will be gradual and well under control. The same general rules apply here, as in negative work, to the treatment of under and over-exposure; a plain solution of bromide of potassium should be at hand for cases of the latter, while the addition to the developer of more of solution No. 2 will help the former.

When the development has proceeded far enough, remove the print, without washing, to the clearing solution, made as follows.

Acetic Acid	½ drachm.
Water	10 oz.

Allow it to soak for a minute or two, pour away the solution and apply a second quantity for a like time; after which the print is well washed and transferred to the fixing bath of hypo; three ounces to the pint of water, for ten minutes or a quarter of an hour. The final washing must be as thoroughly and as carefully performed as usual, and if this is attended to there seems no reason to doubt, in the slightest, the almost absolute permanency of the developed image.

If any trouble should arise from blistering during any portion of the operations, the print should at once be removed into a dish of water, in which a handful of common salt has been dissolved. After a short stay in this, the tendency to blister will usually disappear.

After washing, the prints are hung up to dry spontaneously, if a mat surface is required; but if an enamelled surface is preferred it may be obtained as already described in connection with gelatino-chloride paper. A sheet of glass or polished ebonite is rubbed with powdered French chalk, the surplus being dusted away, and the print is squeegeed into contact, and allowed to dry. When stripped it comes away with a smooth and polished surface. If a still higher glaze be desired, the process given for enamelling albumenised paper prints (see page 109) must be adopted, omitting only the use of the gelatine solution, as the gelatino-bromide surface is itself sufficiently adhesive.

The mounting, spotting, and finishing are done in the ordinary manner. If the prints are to be rolled, care is to be taken that they are perfectly dry, otherwise injury to the surface is almost certain to occur. It is scarcely safe under any circumstances to attempt to burnish a gelatine print, as the film will not bear the friction. But as the highly-glazed surface is only suited to small pictures, the gelatino-bromide is more usually employed for large work, the inconvenience is not great; while as we have already remarked the mat surface is, in the opinion of many, the chief charm of that class of picture. It would obviously be ridiculous in the extreme to attempt to apply any such artificial finish to the "rough-surfaced" papers in the market.

CHAPTER III.

PLATINOTYPE.

The latest claimant among printing processes for popular favour is the Platinotype Process, by which permanent results of a highly artistic character are produced. The process is the subject of a patent, but the proprietors issue licenses to amateurs at a nominal fee, and supply all necessaries for working as well as instructions. We may, for the convenience of our friends, however, recapitulate the instructions here.

The paper is issued in the ready sensitised state, containing only salts of platinum and iron, and in this condition requires to be kept rigorously from damp. This is effected by means of a calcium tube or case, a cylindrical tin case, provided with a compartment for containing chloride of calcium, the powerful affinity of which for moisture keeps the internal atmosphere perfectly dry. The joint of the lid is further covered by an India-rubber band to further hermetically seal the tube. In printing, also, the paper is covered in the printing frame with a sheet of vulcanised rubber, and, indeed, at every stage the utmost care is adopted to avoid the effects of damp. When these precautions are neglected, the result is general flatness and want of vigour, heaviness and muddiness of tone, and loss of purity of the whites.

Before exposure the paper is of a lemon-yellow colour, and upon exposure to light, a faint brownish image is produced, which suffices as a guide to the progress of the print. When the printing is finished, the print must be at once returned to the calcium tube to wait development.

The developer consists of a solution of oxalate of potash of the strength of 130 grains to the ounce of water, raised to a temperature of 170° to 180° fahr. This is poured into a flat enamelled iron dish, supplied for the purpose, and the exposed print floated upon its surface for a few seconds in the same manner as when sensitising albumenised paper. The development is nearly, though not absolutely, instantaneous, but it is necessary to float the print for at least five seconds. Upon raising it from the developing solution, if the exposure has been correctly timed, the faint brown image will be found to have been transformed into one of a rich black hue of great beauty.

A description of the process in theory may assist in a grasp of its working. The paper is prepared with a solution of ferric oxalate, in combination with a salt of platinum, the ferric salt being the sensitive one, suffering reduction to the ferrous state under the action of light. Ferric oxalate itself has no action upon the platinic salt, but when converted to ferrous oxalate it becomes a powerful reducer, though being in that state insoluble it is so far inert. The change of colour on exposure to light depends upon the formation of this insoluble salt, which constitutes the visible image up to that stage, and which lies in intimate contact with another salt which it is capable of reducing to metallic platinum. The developing solution, oxalate of potash, is a ready solvent of ferrous oxalate, consequently, when the exposed print is brought into contact with it the latter is dissolved and becomes active, and instantly reacts

upon the platinum salt, with which it is in contact, reducing it *in sitú* into black metallic platinum.

The hot solution, at the same time, extracts the unreduced and highly soluble ferric salt as well as the superfluous platinum, and so, practically fixes the print. All that now remains to be done is to treat the print to a "clearing" solution, in order to remove every trace of iron salt, which would otherwise cause the subsequent discolouration of the paper. For this purpose it is immersed, without previous washing, in three successive baths of hydrochloric acid diluted with sixty parts of water, in each of which it must remain ten minutes. After leaving the last acid bath, a quarter of an hour's washing in two or three changes of plain water completes the process. If thoroughly washed the image now consists of perfectly pure metallic platinum, and is impervious to the action of the strongest acids, excepting only *aqua regia*.

More detailed instructions are supplied with the materials for working the process.

CHAPTER IV.

COLLODIO-CHLORIDE.

The Collodio-Chloride process of printing is one that gives very beautiful results upon paper, opal, or glass, and the image which is of fine colour possesses a high degree of permanency.

The emulsion is prepared by MAWSON & SWAN, and sold ready for use, merely requiring to be applied to the paper, glass, or opal in the same manner as collodion. Being sensitive to light, it must necessarily be preserved and used in the dark room.

The best results upon paper are obtained upon a sample specially prepared for the purpose, with a highly enamelled surface, which prevents the emulsion sinking into the paper; but very fine work can be done upon ordinary photographic paper, of good quality, previously prepared by immersion in or floating on a solution of gelatine as follows:—

White Gelatine	300 gr.
Chrome Alum	5 gr.
Water	20 oz.

The paper to be coated should be pinned to a light board, a little smaller than itself, one corner of the sheet and the two containing sides projecting about a quarter of

an inch. The emulsion is poured on in the ordinary manner for collodion, and the surplus drained off by the projecting corner; when set, the paper is detached from the board and hung up to dry.

Glass or opal should be prepared by thorough cleaning and polishing with powdered talc, and as an extra precaution to prevent the film slipping, the edges of the plate may be tipped with a thin solution of India-rubber in benzole, three grains to the ounce. The emulsion as well as the coated paper or glass will keep for a considerable time, both before printing and toning, though it is preferable to tone as soon after printing as possible.

The printing is conducted in the ordinary manner, though when glass or opal is used, a special printing frame will be necessary in order to allow the progress of the image to be watched.

The following instructions are abridged from those of Mr. George Bruce, of Dunse, a highly successful worker of collodio-chloride.

The image loses very little of its strength in toning and fixing, the printing should not, therefore, be carried to such a depth as in the case of albumenised paper, except for transparencies, when it will be necessary to print very much deeper in order to get sufficient body.

The prints are washed in three or four changes of water before toning, to remove the free silver, and here it will be found that greater care is needful than with albumenised paper, owing to the tendency of the collodionised paper to curl up. Each print must, therefore, be opened out separately and thoroughly washed in each water.

The toning bath is made as follows:

STOCK SOLUTION.

No. 1.

Sulphocyanide of Ammonium	400 gr.
Hyposulphite of Soda	6 ,,
Distilled Water	4 oz.

STOCK SOLUTION.

No. 2.

Chloride of Gold	15 gr.
Distilled Water	40 oz.

Equal quantities of these solutions are mixed together from three to five hours before use, and shaken up with a quantity of powdered chalk.

The toning solution is filtered and poured into a dish to the depth of not more than quarter of an inch, and the prints are taken singly, opened flat with the fingers and laid face downwards in the solution, the shallowness of which prevents their again curling. They must be kept in motion and turned occasionally to examine the progress of the toning, a flat brush being used to remove any air-bubbles that may form on the surface. The print must be removed from the toning solution and placed in clean water immediately the desired colour is reached, as the tone passes rapidly from rich brown or purple to slaty blue; and care must be exercised that the water has uniform access to the whole surface.

The fixing bath consists of a solution of hyposulphite of soda, one ounce to twelve of water. In immersing the prints in this, and in turning them over, the same care must be adopted in securing uniformity of action, and this applies equally to the subsequent washing. The fixing

will occupy about five minutes, after which the prints are first rinsed separately, and then left for four or five hours to soak in a constantly changing stream of water.

Owing to the contractile nature of the collodionised prints, there is great danger in drying them; the following plan, therefore, should be adopted in trimming and mounting. The print is placed in contact with the glass cutting-shape under water, care being taken not to scratch its surface, and when pressed into position, it is trimmed to shape with a pair of scissors. In mounting, the wet print is laid face downwards upon a sheet of plate-glass, covered with a damp cloth, and the superfluous water removed from the back with blotting paper, or another cloth. It is then covered with starch-paste, or other mountant, placed upon the mount in the ordinary way, and allowed to dry under pressure.

When quite dry, the print is finished by warming it, and gently rubbing it with encaustic paste.

The same process of toning and fixing answers equally for opalotypes and transparencies, but these after drying should be coated with MAWSON & SWAN'S crystal positive varnish.

CHAPTER V.

THE FERROPRUSSIATE OR CYANOTYPE PROCESS.

A process very useful for the reproduction of maps, plans, architectural drawings and similar work, or as a cheap method of taking proofs from negatives, is that known as the Ferroprussiate or Cyanotype.

The paper is supplied ready for use, or may be prepared by brushing over any good white paper with the solution sold by MAWSON & SWAN for the purpose, and allowing it to dry. The process is extremely simple, the paper being placed in contact with the original drawing or sketch in a printing frame, and exposed to light until an image of a grey or brownish-grey colour is formed, the print is then immersed in plain water until the lines become perfectly white, when it is taken out and dried, no further treatment being necessary. This gives a design in white upon a blue ground; if the reverse conditions be required, a negative must first be made or a special paper employed.

The print should not be left in the water any longer than necessary, as the image is gradually dissolved and weakened, it should therefore be removed as soon as the lines become clear. If it be then too weak, it is a sign of under-exposure; over exposure, on the other hand, shows

itself in tinted lines. The blue colour may be changed, if desired, to a purple or purple-grey by immersion in a very weak solution of carbonate of soda, this colour being preferred by many, especially for proofs in half tone.

The stronger the orginal, the longer may the print be exposed without colouring the lines, and consequently the deeper will be the colour; if the drawings are specially made for reproductions by this process, the ink should therefore be as dark as possible.

Where the reproduction is required to be in dark lines on a white ground, an intermediate negative may be made upon ordinary albumenised paper, or MAWSON & SWAN'S bromide paper; this method is especially valuable when a number of duplicate copies are required.

CHAPTER VI.

PHOTO-MECHANICAL METHODS OF PRINTING.

It would be improper to leave the subject of printing without alluding to the various methods classed under the general name of photo-mechanical, and mostly based upon the photographic action of light upon gelatine, and similar substances in the presence of a salt of chromium. The discovery of the fact that a mixture of gelatine with potassium bichromate is rendered insoluble by exposure to light is attributed to Poitevin, though previous experimentalists had used the bichromate in other ways. At any rate, the principle has been applied to the production by means of light, of every form of printing surface, including litho, block, relief, and intaglio printing.

For many years after the discovery of the principle its application made little progress, owing to the difficulty experienced in securing half tone. For line-work it was practicable, but no useful process was devised until, in 1864, J. W. Swan, of the firm of Mawson & Swan, took out his patent for what was then called the Carbon process, and what is now known as Autotype. Though not strictly speaking a mechanical process, it is frequently included among such because it is based upon the action of light,

upon bichromated gelatine. This was the first practical process of printing in half tone in unalterable pigment.

The next process in half tone was that known as Woodburytype, from the patentee, the late W. B. Woodbury, though Mr Swan had independently worked at and nearly perfected a similar process at the time Woodbury's patent was taken. In this process a relief mould is made, by the action of light and subsequent washing in warm water, on bichromated gelatine, and this when dry is pressed into a sheet of type metal forming a reverse, which is used as the printing surface, an ink composed of coloured gelatine being employed. This was the earliest perfect mechanical printing process in half tone, the prints being turned out of the press at the rate of many hundreds a day. A few years since, Woodbury patented a simplification of this process known as Stannotype.

Other processes are Collotype or photo-lithography in natural half tone, by some called also Phototype, and on the Continent Licht-druck, the term photo-lithography being confined to subjects in line or mechanical half tone; photo-zinc or etching processes on zinc are numerous, as are engraving processes and methods of producing relief blocks with a mechanical grain from negatives in half tone.

None of these processes, except perhaps the Carbon process, are likely to be worked by amateurs, so we refrain from describing them in detail. They are useful, however, for purposes of illustration, and, when required, work can be executed by MAWSON & SWAN from amateurs' own negatives at reasonable charges.

PART IV.

MISCELLANEOUS.

CHAPTER I.

ENLARGING.

The practice of enlarging has grown greatly in favour amongst amateurs during the past few years, chiefly, no doubt, in consequence of the introduction of gelatino-bromide papers, which afford such facilities for the amplification of small negatives. The amateur is thus enabled to travel about from place to place to secure negatives while embarrassed with a minimum of weighty baggage; and the long evenings of winter, when no other photographic work is stirring, may be profitably employed in making enlargements from the summer's negatives.

Negatives for enlargement should of course be as technically perfect as possible, as it is to be borne in mind that faults as well as beauties are magnified in the operation. They must be as sharp, as careful focussing, and the employment of a suitable lens can make them, and the image should be well exposed, full of detail, and not possess too great density.

A really sharp negative will bear amplification to

three, four, or even five diameters without appreciable falling off in definition, which means that, from an ordinary quarter-plate negative, enlarged prints may be obtained up to 20 × 15, which will be as sharp as if taken direct. The amateur will therefore be wise in selecting a small size of plate for this as well as other reasons.

Lenses of short focus possess in a higher proportionate degree the qualities of depth of focus and general sharpness of definition than instruments of greater focal length; that is to say, they define objects at different distances, and over a wider area, with greater sharpness; consequently, other things being equal, a small negative taken with a lens of short focus, will bear enlargement to a given size better than a negative originally larger, and not requiring the same amount of amplification to bring it to the same dimensions. Then, again, the smaller negative is more easily illuminated evenly, and if, as most probably will be the case, a condenser is employed for the purpose, a smaller and less costly instrument is required, which, like the smaller lens, will produce a proportionately better result. If to these reasons we add others of economy, both in apparatus, materials, and labour, it will be seen that there is every inducement on the part of the amateur who intends systematically to practise enlarging to adopt a small size of plate to work with, and the one we recommend is quarter-plate, which also answers for direct negatives for lantern slides.

Whatever the size of the original negative, and however perfect it may be, we would advise beginners not to be too ambitious in the size of their enlargements. Quite outside the matter of the extra expense and trouble of manipulating large sizes, there is a point beyond which it

is inadvisible to go, a point at which photographic enlargements from all but the most perfect negatives, both technically and pictorially, cease to be pictures and become eyesores. A negative which, enlarged to say 12 × 10, will give a charming picture, may be utterly ruined if strained to 20 × 24.

The operator who already possesses a moderately good lantern for projection, fitted with condensers and achromatic front lens, may proceed to make his enlargements without further adding to his stock, beyond providing a movable easel or screen upon which to fix the sensitive paper. The negative is inserted in the lantern in place of the ordinary slide, and the image projected upon the screen placed at such a distance as to secure the desired amplification. The focussing is done upon a sheet of white paper pinned to, or pasted on, the easel, and then, the light being shut off, the sensitive paper is pinned in position for exposure.

Those who are not already provided, or who have much enlarging to do, will find an Enlarging Lantern sold by MAWSON & SWAN a conveniently arranged piece of apparatus. It has a polished wood body, lined, double combination achromatic front lens with rack and pinion for focussing, and is fitted with 5-inch condensers of finest quality, and works with a duplex lamp burning mineral oil. It is extremely simple in construction and easy in use, and may be used as an ordinary "optical" or "magic" lantern when required.

It will seldom be the case that the amateur will do his enlarging by daylight, but should he desire to do so, the simplest way is as follows: Select a window having at its upper part at least, an uninterrupted view of a clear

—preferably north—sky. Block up the window with boards or otherwise, leaving only a small opening through which the light may fall upon the negative. At an angle of about 45°, to this aperture arrange a long board, upon which slide a frame to hold the negative, another to carry the lens, and an easel or screen for the sensitive paper. The axis of the lens and the centres of the negative and screen must be in the same straight line, and this being seen to, the whole arrangement may be inclined at any angle. Desirable means must be adopted to cut off all light passing through the window opening except that which falls upon the negative.

In using a portrait, or any but symmetrical form of lens for enlarging purposes, the front combination which is turned to the object in taking a portrait or landscape must now be turned to the sensitive surface; so far as object and reproduction are concerned, it must in fact be reversed. Should a single lens be used, its convex side must be turned to the negative.

Portraits may be vignetted by holding between the lens and the sensitive paper, during exposure, a sheet of cardboard or tin with an aperture cut in the centre. By this means the light is prevented from acting upon any but the centre of the sensitive paper, and if the distance between the vignetting mask and the lens be so adjusted that the mask is entirely out of focus, and if it be kept gently in motion during exposure, any degree of softness in the graduation of the vignette may be secured.

The majority of enlargements will be made direct upon gelatino-bromide paper, the manipulation of which has been already described in Part II. But instances may arise where prints are required upon ordinary albumenised paper or other medium too slow for direct enlarging; or

large numbers of prints may be wanted from the same subject, when the process of making an enlarged negative may be adopted.

A transparency is first made by contact printing from the original negative, a full exposure being given so as to secure every detail of the original, with moderate but not excessive strength. Any defects in the original must be touched out in the negative and transparency, and from the latter an enlarged negative is then made in the ordinary manner upon a gelatino-bromide plate, or upon paper. Or the process may be reversed, an enlarged transparency or positive being used to make a negative by contact printing. The first method is much to be preferred.

The enlargements, when completed, are greatly improved by a little artistic touching, to give depth to the heaviest shadows, crispness to the high lights, and to sharpen up portions where the definition is deficient. Unless the amateur possess the power of using the brush, this had, however, better be deputed to an artist who devotes himself to that class of work.

The annexed table of conjugate foci will be found useful in fixing the relative positions of negative, lens, and sensitive paper when an enlargement to a definite scale is required. In the outside vertical columns will be found the focal length of the lens, and the top horizontal line shows the times of enlargement or reduction. Under each of these figures, and opposite each lens, will be found two linked numbers which represent the conjugate foci or distances between the optical centre of the lens and the negative and sensitive surface respectively, the upper or longer being between lens and sensitive surface in enlarging, and the opposite in reducing. Thus, to enlarge three

diameters with a six-inch lens, the latter should be eight inches from the negative and two feet from the sensitive paper.

Table of Enlargement and Reduction.

Focus of Lens in Inches.	Times of Enlargement and Reduction.										Focus of Lens in Inches.
	1	2	3	4	5	6	7	8	9	10	
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$	45 5	$49\frac{1}{2}$ $4\frac{19}{20}$	$4\frac{1}{2}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$	50 $5\frac{5}{9}$	55 $5\frac{1}{2}$	5
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$	60 $6\frac{2}{3}$	66 $6\frac{3}{5}$	6
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$	70 $7\frac{7}{9}$	77 $7\frac{7}{10}$	7
$7\frac{1}{2}$	15 15	$22\frac{1}{2}$ $11\frac{1}{4}$	30 10	$37\frac{1}{2}$ $9\frac{3}{8}$	45 9	$52\frac{1}{2}$ $8\frac{1}{2}$	60 $8\frac{4}{7}$	$67\frac{1}{2}$ $8\frac{7}{16}$	75 $8\frac{1}{3}$	$82\frac{1}{2}$ $8\frac{1}{4}$	$7\frac{1}{2}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9	80 $8\frac{8}{9}$	88 $8\frac{4}{5}$	8
$8\frac{1}{2}$	17 17	$25\frac{1}{2}$ $12\frac{3}{4}$	34 $11\frac{1}{3}$	$42\frac{1}{2}$ $10\frac{5}{8}$	51 $10\frac{1}{5}$	$59\frac{1}{2}$ $9\frac{11}{12}$	68 $9\frac{5}{7}$	$76\frac{1}{2}$ $9\frac{9}{16}$	85 $9\frac{4}{9}$	$93\frac{1}{2}$ $9\frac{7}{20}$	$8\frac{1}{2}$
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$	90 10	99 $9\frac{9}{10}$	9
10	20 20	30 15	40 $13\frac{1}{3}$	50 $12\frac{1}{2}$	60 12	70 $11\frac{2}{3}$	80 $11\frac{3}{7}$	90 $11\frac{1}{4}$	100 $11\frac{1}{9}$	110 11	10

CHAPTER II.

LANTERN SLIDES.

There is no more popular application of photography at the present day than to the production of transparencies for the optical lantern, and the most modern amateurs in photography are usually possessors of that instrument also. Under these circumstances, then, it will be very probable that the majority of our readers will desire to embark in the making of Lantern Slides.

There are two methods by which this may be done, either by contact printing direct from the negative upon the Mawson Lantern Plates, Collodion Emulsion, or Collodio-Chloride; or, if the negative be of larger size, the camera must be resorted to to obtain the necessary reduction, the Wet Collodion Process as well as those just detailed being then available.

The regulation size of lantern picture is $3\frac{1}{4} \times 3\frac{1}{4}$, but they are sometimes made upon quarter-plates, the longer side forming the base line of the picture. It is thus clear that no size of negative, except the quarter-plate, is available for contact printing without sacrificing a large portion of the subject; and as the subject is usually arranged to give the best effect for the full size of plate as represented by the ground glass, to curtail it in any way most usually spoils the composition. Hence the necessity for using the camera.

The quarter-plate may, however, be safely used, especially if the object be kept in view when selecting and arranging subjects. A square should be distinctly marked in the centre of the ground-glass of the largest dimensions of the lantern picture, say 3 × 3 or $2\frac{7}{8} \times 2\frac{7}{8}$, and the subject arranged to the best advantage within this area.

The shape of the picture itself is not always necessarily square, though the slide is; a more artistic result is frequently obtained by making it circular, oval, "dome," or "cushion" shaped, or by cutting off a portion of the foreground to form an oblong. This latter shape is also useful when reducing from large negatives of an elongated form, such as $7\frac{1}{2} \times 5$. But though this is finally arranged in the making and mounting of the slide, it would be better if more attention were given when arranging the picture, to a study of the composition in connection with possible variations in its shape.

For contact printing no special instructions are required, the negative is laid face upwards in a printing frame, and one of the MAWSON Lantern Plates placed in contact with it and exposed to gaslight at a distance of a foot from the flame for a few seconds.

For reducing in the camera, a simple arrangement similar to that described in connection with daylight enlarging will suffice. A flat board of suitable length, which will depend upon the focus of the lens to be used, and the size of the negatives to be used is provided; if it be from three to four feet long, it will answer almost any requirements. Upon this the camera and a frame to hold the negative are arranged to slide (the centres of the lens and negative being opposite to one another), and both being capable of being firmly clamped in any position. Or the negative frame may be permanently fixed at one end of

the board and perpendicular to it. Any camera may be used, provided it has a sufficient extension of focus, which will be, at its greatest, for equal size reproduction, twice the focal length of the lens employed. Of course we are presuming that care will be taken that coincidence is secured between the centres of the lens and plate which if of larger size than quarter-plate, will require an inner frame for the dark slide.

With such an arrangement directed towards a clear sky or evenly lighted sheet or white wall, the most perfectly illuminated slides are obtained. It is advisable to throw a light cloth or folded sheet of brown paper over the arrangement to shut off all light from the lens, except that which passes through the negative; this is not absolutely necessary unless working out of doors, though it adds to the brilliancy of the illumination and consequently of the slide.

For working with artificial light the same arrangement is employed, being placed horizontally upon an ordinary table. A sheet of ground glass is placed about an inch from the negative, on the opposite side from the camera, and two or three paraffin lamps or gas burners or a length of magnesium wire are burnt at such a distance as to illuminate the screen with tolerable evenness. Or a strong flood of light may be allowed to fall upon a large sheet of white paper, and the negative brought as close as possible to that. The exposure, in such cases will, however, be comparatively long.

Development, &c.—The following is the method of using the *Mawson Lantern Plate* which is specially prepared for this purpose, and strongly recommended on account of its rapidity and quality.

Before exposure, carefully dust the surface of the plate, and, especially if a contact exposure is to be made, see that the surface of the negative is also perfectly clean. Give a full but not too long exposure. The following are the Stock Developing Solutions :—

A

Pyrogallic Acid	40 gr.
Metabisulphite of Potash	120 gr.
Distilled Water	20 oz.

B

Liquid Ammonia sg ·890	2½ dr.
Bromide of Ammonium	40 gr.
Distilled Water	20 oz.

Mix equal parts of A and B for use.

The development is rather slow in commencing, but proceeds with regularity ; the lights of the picture should remain perfectly clean, and if from over-exposure any tendency to "veil" should exhibit itself, some drops of a sixty-grain solution of bromide of ammonium should be freely used. The density should depend upon the character of the light with which the slides are to be used. With a proper exposure the development will be complete in from four to six minutes, but it will be proportionately longer with either over or under exposure.

Fix in a solution of hypo, one pound to a quart of water and wash very thoroughly.

The manipulation of the various other kinds of plates has been fully described in the special chapters devoted to them, and it only now remains to describe the chief characteristics of a good lantern slide, and to point out the slight modifications in development desirable in order to secure these.

The first requisite is perfect clearness of the lights and

freedom from fog; a slight veil that would pass absolutely unnoticed in a negative would utterly mar an otherwise good lantern slide. Full detail and gradation must also be secured, without over-density or hardness; indeed, the deepest shadows of the picture should be penetrable by the light. With regard to the degree of density necessary, this will depend upon the kind of light to be employed in the lantern, oxyhydrogen requiring greater strength than oil; and also upon the size of the enlarged picture. A transparency, suitable for an oil lantern, would, upon the same sized sheet, be rendered very weak and flat by the greater penetrating power of the lime-light, but would improve as the enlargement became greater. Conversely a transparency, specially made for the lime-light, might, on a 10 or 12 foot disc, be too heavy for an oil lantern, though it would show well on a much smaller sheet. This it is well to know, as it enables the amateur to have private exhibitions at home, on a small scale, with slides that are, perhaps, specially made for public exhibition.

In developing, by whatever process, the object must be, therefore, to get brilliancy and gradation, and this is best attained by giving a full exposure—not, by any means, an unnecessarily long one—and developing to full strength, at once, by means of a powerful but well restrained solution, as, considering the comparative uniformity attainable with artificial light, there is, practically, no difficulty in hitting upon the correct exposure; this part of the process is perfectly easy, and only requires a little observation and care on the part of the operator. The slides are fixed and washed in the ordinary manner, but in the case of gelatine plates, in order to secure the greatest clearness, should invariably have a wash with a saturated solution of alum to each quart of which is added 1 ounce of hydrochloric acid.

Lantern slides are better not varnished, but if t be preferred to varnish them, use MAWSON & SWAN'S Crystal Positive Varnish.

The slides are finished by mounting in contact with another glass, a matt of black paper—supplied for the purpose with various shaped apertures—intervening, the edges being neatly bound together with a strip of black paper, also supplied ready cut. The operation of binding is neatly and rapidly performed as follows: Lay one of the strips (which are a little over 13 inches long by about three-eighths wide) upon a convenient surface, and thoroughly treat it with a strong paste containing a little sugar. Take the slide with its covering glass, and with the edges accurately coinciding and tightly pressed together; place one edge in the centre of the width of the strip of paper as it lies, and at the extreme end. Press into contact, lift the strip, and with the fingers neatly fold it over the front surfaces of the glasses. Now, with a fine-pointed pair of scissors, cut through, at each side, that portion of the strip which folds over, leaving unsevered only the centre which attaches to the edge of the glasses, and proceed to fold over the next side, turning down the paper neatly at the angle passed, upon that portion of the strip already laid down, so proceeding until all four sides are bound, when any excess in length is trimmed away. After removing any adhering paste with a piece of linen and warm water, the slide is finished.

CHAPTER III.

OPALS.

No more beautiful picture emanates from the portrait photographers' studio than a well-executed picture upon opal glass. MAWSON & SWAN'S Opal Plates are specially prepared to meet the want for a clean, rapid, and trustworthy plate for this class of work, and can be strongly recommended for the purpose.

Delicate negatives full of detail are best suited for opal work. The exposure should be accurately timed, neither over nor under-done, as the combined brilliancy and softness of the result depend upon a correct exposure. The plates in handling must be guarded to the utmost from even red light, as the delicate white tint of the opal is sullied by any slightest suspicion of fog.

The exposure may be made by contact printing under a negative or in the camera; but except for purposes of enlargement or reduction, the former is far the more convenient. An exposure of from twenty seconds upwards, at a distance of three feet from an ordinary gas burner, will suffice according to the density of the negative.

The development proceeds very gradually, and is performed with the following solutions :—

No. 1.

Neutral Oxalate of Potash	20 oz. avoird.
Bromide of Potassium	40 gr.
Distilled Water to make	80 oz. fluid.

No. 2.

Ferrous Sulphate	6 oz. avoird.
Distilled Water to make	18 oz. fluid.
Sulphuric Acid	14 minims.

One part of No. 2 being added to seven parts of No. 1 for use. Development usually takes from 3 to 5 minutes, but it must be stopped immediately the detail is out and the print sufficiently dark. When sufficiently developed pour off the developer, and, *without washing*, flood the plate with Clearing Solution, and allow it to act for one minute; then wash and fix for fifteen minutes, afterwards wash for several hours, frequently changing the water.

CLEARING SOLUTION.

Acetic Acid (1·044)	½ oz. fluid.
Water	80 ,, ,,

FIXING SOLUTION.

Hypo	2 lb. avoird.
Water	80 oz. ,,

Mawson & Swan's Positive Crystal Varnish may be used when it is desired to protect the film.

PART V.

HINTS ON PRACTICE.

It now only remains to give a few practical hints on the use of the apparatus and materials already described, in order that the new beginner may have a prospect of commencing work in an intelligent and systematic manner. In doing so we shall confine ourselves strictly to the technical side of the question, and refrain from any attempt at instruction in the art phases of photography, which would be beyond the scope of these few pages.

For purposes of convenience these hints will be classified under four heads, viz.: Portraiture, Landscape, Architecture, and Instantaneous.

CHAPTER I.

PORTRAITURE.

Probably portraiture is the first attraction of most incipient photographers, the pleasure of being able to photograph friends, acquaintances, and relations, being one that few can resist after once witnessing it in practice. Later comes the charm of out-door work, with its artistic as well as health-giving surroundings, but this to the majority of amateur photographers constitutes the holiday recreation where portraiture is the every day practice. For portraiture possesses this advantage over other branches of the art, that it requires no travel to find

subjects, nor any great expenditure of time or money; the subjects are ready to hand and ever willing, and the portrait amateur need never be at a loss for work for his camera.

Portraiture may be of two classes—indoor and outdoor; we, of course, start on the presumption that no "studio" is available, and, if it were, it is questionable whether any better or more artistic results would be produced; for with sufficiently rapid plates it is doubtful whether the effects produced in an ordinary room by a clever manipulator are not superior to those obtainable in the conventional glass house with its flood of light.

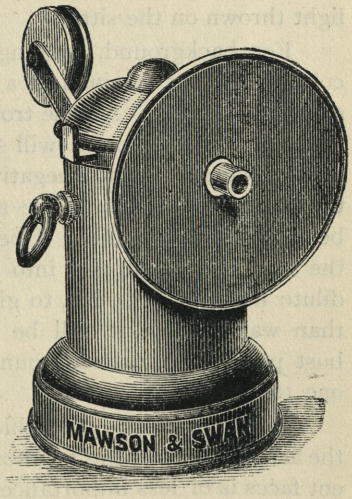
The requirements for indoor portraiture are first an apartment with a window of good dimensions; height is of greater value than breadth, since the higher portion of the window admits more of the light from the best part of the sky and throws it farther into the room, thus permitting softer effects to be obtained. A bow window is useful as assisting in softening the contrast between the light and shadow sides of the face. If the window face north there will be little trouble from too obtrusive sunshine; but if a northern aspect be not available the window must be provided with a light blind or translucent screen. Such a screen, with the sun shining directly on it, gives a beautifully brilliant and at the same time soft illumination.

A moveable reflector screen must be provided to lighten the heaviness of the shadow side of the picture; this may consist of a special frame constructed for the purpose, or a folding drawing-room screen can be utilised by throwing over it a sheet or cloth of suitable colour. The reflector must be placed at the proper angle and distance from the figure for each separate operation, according to the effect that is desired or may be most suitable; and the operator should bear in mind that the

shadows appear lighter to the eye than they are to the sensitive plate. It will be well also to remember that the nearer the sitter is placed to the window the stronger will be the contrasts; these may be softened by increasing the distance, though at the expense of a proportionately increased exposure. The value of the reflector depends, too, upon its size and distance as well as its nature; thus for brilliantly lighting up a very deep shadow a small looking glass may be employed as close to the sitter as possible; where for producing a broad soft effect a large expanse of matt surface far removed is best. The best material for the reflector is coarse calico, and if it be coloured, a pale neutral tint or grey, it will be better than if white.

For indoor portraiture, a portrait lens of the more rapid type is a necessity.

Much must be left to the judgment of the operator as to the style of portrait adopted, but we do not recommend anything more ambitious than busts or half-length figures. For full length standing figures, few ordinary rooms will afford sufficient distance for the camera, while the lighting from a single window is practically impossible.



Portraiture in the evening by artificial light is now a possibility, and finds favour with many amateurs. Mawson & Swan's clockwork Magnesium Lamp (see figure) provides a cheap and

efficient means of gratifying the taste for drawing-room portraiture; it is so compact as to be capable of being carried in the pocket, and is ready for use in a moment when required. If skilfully employed its results will compare with those obtained by daylight.

For portraiture out of doors, no very special preparations are needful, beyond an arrangement for preventing too much top-light from falling upon the sitter, which would cause heavy shadows under the eyebrows, nose, and chin. The sitter should be placed under an awning or projecting shade, such as a porch or doorway, which frequently, also, come in well as accessories to the portrait. The broad double doorway of a coach house forms an admirable portrait studio, and the swinging doors may be utilised as screens and reflectors to vary the quantity and character of the light thrown on the sitter.

For background, nothing answers better than stout cotton sheeting strained on a light wooden frame so as to show no creases. A little trouble devoted to the preparation of the background will save a great deal of dodging and "doctoring" of the negative in printing. For vignettes, the background should be as light as possible, without being absolutely white; if before stretching on the frame, the sheeting be dipped into and wrung out from a very dilute infusion of coffee, to give it a tinge a little deeper than washleather, it will be about right. For ordinary bust portraits, the background may be darker, but avoid one too dark.

In taking groups, the chief point to attend to will be the arrangement of the positions; the lighting of the different faces is of less importance than in individual portraits, the placing of the figures being paramount. Not merely from an artistic point of view is this necessary, but in order

to secure proper definition; thus, quite independently of artistic or pictorial effect, it is desirable in arranging a group of a large number of persons, to place them in a semi-circular or slightly crescent form; this assists in bringing the centre and extreme outside figures into focus on the flat plate at one and the same time, and so enables a larger stop to be used, and the exposure consequently is shorter.

There is a class of work the amateur portraitist is too frequently asked to execute, but which he should decline, wherever possible, if he values his comfort; we allude to babies, dogs, cats, and other pets. It is hopeless to attempt such subjects indoors, even with the most rapid lens; the only way to deal with them—where they must be done—is to take them in the open air, and then with an instantaneous exposure.

CHAPTER II.

LANDSCAPE.

It is in landscape work that the tyro will first feel his photographic enthusiasm arise, especially if he be among fine scenery; but it is quite probable that his first impression of his results will be those of disappointment if not of disgust. The first tendency on the part of the budding photographer is to expose plate after plate upon the first likely subjects that present themselves, without critically examining them to see if they are worth reproduction, or if the point of view is the best that can be selected. The fact is, the first thing to be learnt by the landscape photographer is to view things as the lens views them, and to convey the same impression to the brain that the lens conveys to the sensitive plate. The beginner is too apt to imagine that what appears to the eye a lovely scene must necessarily be so in the photograph; and even if it looks so on the ground glass of the camera, he forgets that the sensitive plate takes no cognizance of colour, to which this view perhaps owes its chief beauty. Or, perchance, he overlooks the fact that while gazing on the scene that charms him, the eye overleaps and ignores some hundred feet or yards of flat and uninteresting or positively unlovely foreground, which in the photograph monopolises the greater portion of the plate, while the concentrated loveliness of the natural view finds itself condensed into a narrow

slip between foreground and sky that entirely fails to even suggest the truth; for the lens cannot portray in the flat plate the relief and distance and sense of atmosphere that the eye instinctively recognises.

It is necessary, therefore, to educate the eye to distinguish those subjects that form suitable food for the camera; this is entirely distinct from any artistic education, and refers purely and simply to the study of the conditions which surround the technicalities of photography. Of course a sense of artistic feeling will greatly aid in this respect, and will at all times prevent the introduction into a picture of a great amount of useless foreground. But artistic feeling cannot conquer all difficulties; yet those before which it is powerless will frequently yield to technical remedies. As an illustration of this, an instance may be given which actually occurred some years ago. At a meeting of one the photographic societies, a member exhibited amongst a number of other stereoscopic pictures a view which was unanimously decided to be one of the loveliest bits of scenery any of the parties present had ever seen, and in course of the ensuing season the locality was selected for an out-door trip, with cameras. Arrived before the chosen view all were enthusiastic as to its beauty, but some of the more knowing ones regarded it with a certain dissatisfaction, and then commenced to wander about in a restless manner, planting the camera first here and then there, but never allowing it to remain. In the end, though all, including the original introducer, photographed the scene, not one succeeded in making a picture of it. Upon comparing pictures at the next meeting with the original stereoscopic slide, it was at first supposed that the latter had been taken from a different point of view; but this, from the nature of the locality was at once seen to

be impossible, since immediately in front of the spot whence all the pictures were taken the rocks descended precipitously into the bed of a narrow river, on the opposite side of which the ground rose rapidly, covered with boulders and stunted bushes, till it reached a broad belt of heavily wooded slope, through a break in which a sunlit valley backed up by picturesquely out-lined mountains was seen. The difference between the stereoscopic rendering of the scene, and the subsequent attempted imitations was that whereas in the latter the greater part of the picture was taken up by the foreground of rising moorland, devoid of all pictorial value in itself, and utterly ruining the composition, the original picture *ignored* all that, and commenced where the real beauty was to be found. It was discovered upon investigation that by the merest accident, an exceptional subject had been treated in an exceptional manner, and that by chance rather than by choice a picture had been made. The original picture was taken with a pair of lenses of eight inches focus, an abnormal length for a plate so small, enabling it to reach right over the obnoxious foreground. To produce the same result upon a $7\frac{1}{2} \times 5$ and 12×10 plate respectively, would have required lenses of 18 and 32 inches focus.

Though it is extremely useful to have a selection of lenses available for special purposes, it is on the other hand unwise for general work to encumber oneself with too many; not only is the weight more than necessary, but the variety of lenses actually bewilder the operator in his choice. Two lenses are quite sufficient for all ordinary work, a long focus, which may at the same time be rapid, for distant and instantaneous subjects, and a shorter focus for near objects and interiors.

A similar warning may be given against the employ-

ment of a large number of different stops, each requiring a separate calculation of its value. If one stop with each lens be systematically employed for all ordinary subjects, a second will scarcely ever be required; in fact, for general purposes, two stops for ordinary and rapid work are really all that are needful.

The next item that will trouble the tyro will be light and exposure. First, as to direction of light, he will have to learn that however charming may be the effects to the eye, and artistically when the sun is shining straight—or nearly so—into the eye, or when it is visible in the field of view, such effects can only be ventured upon in the camera by one who is thoroughly conversant with his subject, his tools, and the effect he desires to secure; to a novice, failure, hopeless and complete, is certain. But on the other hand, he should avoid going to the opposite extreme, and carefully placing himself and his camera directly between the sun and the view, which would then be but a flat shadowless prospect. Plenty of variety in lighting will be found between those two extremes.

Great differences of opinion have been expressed as to whether the best results are obtained in sunlight, or by diffused light, but it may perhaps be conceded that each has its advantages for particular subjects, and that no preference can be given to either. Pictures taken in sunlight exhibit more vigour and contrast, while those taken on a cloudy day possess greater softness. The most favourable days, as regards quality of light, are those of the late spring and early summer, when the sky is full of fleecy clouds with the sun shining through them; these are the days for instantaneous work, but when the sky is unclouded and the sun shines like burnished copper, long exposures and generally unsatisfactory results may be expected.

The following table has been published by Dr. Scott, and shows the comparative exposures required at different hours and seasons of the year, during the time the sun is above the horizon. It is based upon a supposed average quality of light at different periods, but cannot of course be taken as absolutely accurate, but may serve as a rough guide to those commencing.

Table of Comparative Exposures at different Hours and Seasons.

Hour of Day. a.m.	p.m.	June.	May July	April Aug.	Mar. Sept.	Feb. Oct.	Jan. Nov.	Dec.	Hour of Day. a.m.	p.m.
12		1	1	1¼	1½	2	3½	4	12	
11	1	1	1	1¼	1½	2½	4	5	11	1
10	2	1	1	1¼	1¾	3	5	6	10	2
9	3	1	1¼	1½	2	4	12	16	9	3
8	4	1½	1½	2	3	10	—	—	8	4
7	5	2	2½	3	6	—	—	—	7	5
6	6	2½	3	6	—	—	—	—	6	6
5	7	5	6	—	—	—	—	—	5	7
4	8	12	—	—	—	—	—	—	4	8

Tables have also been published of comparative exposures required for different subjects, but we refrain from reproducing these, as they can be so easily made to mislead, rather than to assist. The best plan is to note carefully the exposures given, in all cases with the attendant

circumstances, and with these data to compare with the results, experience in timing exposures will rapidly be gained. The golden rule to observe is, always to give a "full" exposure; that is to say, a little more than is considered really necessary. Do not let it be overdone, for over-exposure is in its way as objectionable as the reverse: but if twenty-five per cent margin be allowed, no harm will be done, but on the contrary, things are made more comfortable all round.

The landscape photographer should keep careful note of every exposure he makes, whether the plate is to be developed at once, or kept for some time, as when travelling, but especially so in the latter case, or where a large number of exposures are made. Notwithstanding the latitude, of which we have spoken in another chapter as being allowed in exposure and development, it is a veritable "leap in the dark" to commence to develop a plate, the whole history of which is not well known; as well might you attempt to aim at a mark with the eyes closed. Besides, such a register of subjects and exposures forms a permanent record, and a guide for reference at any future time for advice as to exposure in particular classes of subjects.

A few words on the subject of preparing for a photographic trip, and the arrangements when travelling, may not be out of place. Do not hurry the preparations, and have an inventory prepared of every article required, and when all is packed, have a "full-dress rehearsal" by unpacking, and going through the operation of taking a photograph, in order to see that everything is in place. Do not err by taking too many things on a journey. Camera, lens, stand (with the not unimportant attachment of screw), dark slides, and instantaneous shutter, will, of course, be looked after, but do not omit focussing cloth, focussing

glass, spirit level, note book, and pencil. These form the inevitable accompaniments of the out-door worker, who should also be provided with a folding lantern, a supply of plates, a dusting brush, and a small supply of *extra* materials for repacking the plates, in case anything goes wrong with the original wrappings.

With regard to development *en route*, we would strongly dissuade the amateur from attempting it, as, if it be properly done, it will be at such an expenditure of trouble as to detract greatly from the pleasure and benefit of the trip. But it is practically impossible to do justice to the work of developing when in strange quarters, unfitted for the purpose; hence, if the amateur be wise, he will adopt the advice given and develop after his return home. If the system of giving full exposures be adopted, and a careful record kept, not the slightest difficulty will be experienced. If for any particular reason some special plate be required to be developed, facilities may now be found in almost any town of importance.

CHAPTER III.

ARCHITECTURE.

The special remarks referring to architectural photography are confined almost exclusively to the mechanical portion of the subject. Reference has been made in the chapter on lenses to the necessity for the selection of a rectilinear lens, or one giving straight marginal lines, while, in discussing cameras the use of the swing-back was explained. Authorities differ somewhat on the point as to which is the more correct in principle, the swing-back or swing-front, but there can be no question in the matter of convenience. Many operators, however, prefer to use the *sliding* front, keeping the camera level, to employing the swing-back, though very few ordinary cameras permit of sufficient movement of the front to be of any great use. Whichever plan be adopted, a small stop must be used in the lens in order to give marginal definition, and the lens employed must be one that will cover a larger sized plate than the one in use.

In extremely confined situations, and for interiors, it is frequently necessary to employ very short focussed or "wide-angle" lenses in order to get the whole of the subject on to the plate; but such results are never satisfactory from the exaggerated or distorted perspective they exhibit. The wide-angle lens is occasionally useful, but should not be invariably employed either for architectural or other

purposes. That is to say, it should not be invariably employed *as* a wide-angle lens by going as near to the object as possible. If it be used at a proper distance its perspective will be as good as that of any lens, but then its short focus dwarfs the image. On the whole a lens of moderate angle and focus will be found the best.

In photographing interiors, great trouble arises from the fault known as "halation," that is, a spreading of the light from the windows into surrounding parts of the picture. This defect varies very much with different samples of plates, and though it cannot be altogether cured with certainty, it may be mitigated by painting the back of the plates with a mixture of lamp-black or burnt sienna, with treacle or glycerine. This arrests the reflection of the light from the back inner surface of the glass which is one of the causes of the evil.

The fine tracery of windows is frequently entirely lost from solarisation, the window being rendered as one even mass of opaque deposit. This may often be remedied by gently rubbing that part of the dried negative with a soft rag, moistened with methylated alcohol until the excessive deposit is reduced, and the tracing becomes apparent. Or finely powdered cuttle fish bone may be applied, dry, to abrade the film. When a fine result is desired, and it can be done, the window may be wholly covered up with curtains, or a temporary brown paper screen, during a portion of the exposure; if no other windows exist to light the interior, artificial light may be resorted to, but, at any rate, the chief portion of the lighting should be done without the assistance of the window it is desired to portray, this being only uncovered for a sufficient time to produce its own impression. The same operation of covering the window is also useful in preventing cross lighting.

As a general rule the best method of developing interiors is to use a weak developer, in which the proportions of pyro and bromide are reduced to a greater extent than the ammonia. This remains a comparatively energetic developer, but incapable of giving any great density. When a thin image, full of detail, is thus produced, it may be easily intensified by any of the methods given.

Architecture, especially interiors, is better taken in the absence of direct sunlight, which, while adding much to the picturesqueness of outline, tends to hide or distort details. There are, of course, instances when sunlight is preferable, but for general work its absence is to be preferred.

CHAPTER IV.

INSTANTANEOUS.

We have but little to say on this subject, beyond warning beginners not to make instantaneous work their *summum bonum*. Feats of legerdemain in exposure are all very well as such, but the results are very seldom pictures, and consequently they soon cease to please.

Our advice is to resort to the drop shutter only when necessary, or when by doing so some useful end—such as the production of an artistic study—will result.

For moving objects the "finder" should invariably be employed, as nothing mars the effect of a picture more than to find its principal object escaping as it were from the plate. The employment of a larger size of plate than the finished picture also helps in the securing of a final result that will give satisfaction, as it affords a better chance of centreing the subject.

In developing, the plate should be first soaked in the dilute alkali, the pyro and bromide being subsequently added after, say one minute. Development then proceeds with rapidity, and all that can be got out of the exposure is produced by this treatment.

APPENDIX.

ADDITIONAL USEFUL FORMULÆ.

THE WET COLLODION PROCESS.

The Negative Nitrate Bath.

Nitrate of Silver	1 ounce.
Distilled Water	14 fluid ounces.
Iodide of Potassium	½ grain.
Strong Nitric Acid	1 minim.

Dissolve and filter.

The Nitrate Bath for Positives or Ferrotypes.

Nitrate of Silver	1 ounce.
Distilled Water	16 fluid ounces.
Nitric Acid	2 minims.

Dissolve; saturate with iodide of silver and filter.

Iron Developer for Negatives.

Protosulphate of Iron	¼ ounce.
Glacial Acetic Acid	¼ ,,
Spirit of Wine	½ fluid ounce.
Water	8 fluid ounces.

Or,

No. 1.

Protosulphate of Iron	½ ounce.
Sulphate of Copper	½ drachm.
Water	5 fluid ounces.

No. 2.

Nitrate of Baryta...	½ drachm.
Glacial Acetic Acid	2 fluid drachms.
Spirit of Wine	½ fluid ounce.
Water	5 ,, ,,

Dissolve in separate bottles; mix and filter.

Iron Developer for Positives or Ferrotypes.

Protosulphate of Iron	180 grains.
Nitrate of Baryta	120 ,,
Alcohol	½ fluid ounce.
Nitric Acid	30 minims.
Water	5 fluid ounces.

Developer for Collodion Transfers.

Pyrogallic Acid	60 grains.
Acetic Acid	1 fluid ounce.
Citric Acid	30 grains.
Alcohol	1 fluid ounce.
Water	20 fluid ounces.

Re-developing Solutions for Negatives.

No. 1.

Nitrate of Silver	10 grains.
Distilled Water	2 fluid ounces.

No. 1.

Pyrogallic Acid	10 grains.
Citric Acid...	25 grains.
Distilled Water	2 fluid ounces.

No. 3.

Protosulphate of Iron	10 grains.
Citric Acid...	10 grains.
Distilled Water	2 fluid ounces.

This at the time of using equal parts of No. 1 and No. 2:

or take a sufficient quantity of No. 3 and add a few drops of No. 1.

Or,

A

Pyrogallic Acid	3 grains.
Water	1 ounce.

B

Nitrate of Silver	20 grains.
Acetic Acid	2 fluid drachms.
Citric Acid	20 grains.
Water	2 ounces.

Add a few drops of **B** to sufficient of **A** at the time of using.

Fixing Solution for Negatives.

Hyposulphite of Soda	1 ounce.
Water	4 fluid ounces.

Or,

Cyanide of Potassium	$\frac{1}{4}$ ounce.
Water	10 fluid ounces.

The latter may also be used for Positives or Ferrotypes.

Bleaching Solution for Alabastrine Positives.

Bichloride of Mercury	1 ounce.
Chloride of Ammonium ...	1 ounce.
Water	1 pint.

THE DRY COLLODION PROCESS.

India-Rubber Edging Solution.

Pure Bottle Rubber	6 grains.
Benzole (free from grease) ...	2 ounces.

Organifiers for Dry Plates.

Tannin	10 grains.
Alcohol	10 minims.
Water	1 fluid ounce.

Or,

Freshly Ground Coffee	1 ounce.
Loaf Sugar	1 ,,
Water	1 pint.

Boil and filter.

Organifier for Wet Collodion Emulsion.

Gelatine	60 grains.

or

The White of One Egg.	
Carbonate of Soda	10 grains.
Water	10 ounces.

Dissolve and filter; immerse the washed plate for two minutes and expose while still wet.

Developing Solutions for Collodion Emulsion.

A

Pyrogallic Acid	60 grains.
Citric Acid	1 ,,
Alcohol	1 ounce.

B

Liquid Ammonia ·890	1 fluid drachm.
Water	15 ,, ,,

C

Bromide of Potassium	10 grains.
Water	1 fluid ounce.

To each fluid drachm of water add 2 minims each of **A** and **B** and 1 of **C**. When all the details are out, mix and apply a fresh solution, containing double those quantities to produce density.

Intensifying Solutions for Collodion Emulsion.

A

Pyrogallic Acid	60 grains.
Citric Acid	1 ,,
Alcohol	1 fluid ounce.

B

Nitrate of Silver	30 grains.
Citric Acid	15 ,,
Nitric Acid	10 minims.
Water	1 fluid ounce.

Add one or two drops of **B** to each fluid drachm of **A** at the time of using.

GELATINO-BROMIDE AND GELATINO-CHLORIDE FORMULÆ.

The "Mawson Plate" Developer.

Stock Solution.

Pyro (437½ grains)	1 ounce Bottle.
Ammonium Bromide	219 grains.
Metabisulphite Potass	437½ ,,
Distilled Water to make up to	11 ounces.

The sulphite and bromide must be thoroughly dissolved in a part of the water before the pyro is added.

For Studio Work.

1.—Stock Solution	1½ ounces.
Distilled Water	18½ ,,
2.—Ammonia (.890)	2½ drachms.
Distilled Water	20 ounces.

Use equal parts mixed of 1 and 2 just before development.

The "Castle Plate" Developer.

Stock Solution.

Pyro	1 ounce Avoird.
Nitric Acid	30 minims.
Ammonium Bromide	1 ounce Avoird.

Distilled Water to make up to 11 ounces Fluid.

1.—Stock Solution	1½ ounces.
Distilled Water	18½ ,,
2.—Liquid Ammonia	2½ drachms.
Distilled Water	20 ounces.

Use equal parts of 1 and 2 mixed just before development.

The Photo-Mechanical Plate Developer.

A

Pyrogallic Acid	60 grains.
Metabisulphite of Potash ...	60 ,,
Distilled Water	20 ounces.

B

Liquid Ammonia	2 drachms.
Ammonium Bromide	30 grains.
Distilled Water	20 ounces.

Use equal parts of **A** and **B**.

The "Lantern Plate" Developer.

A

Pyrogallic Acid	40 grains.
Metabisulphite of Potash ...	120 ,,
Distilled Water	20 ounces.

B

Liquid Ammonia	2½ drachms.
Ammonium Bromide	40 grains.
Distilled Water	20 ounces.

Use equal parts of **A** and **B**.

The Opal Plate Developer.

1.

Neutral Oxalate of Potash	...	20 ounces avoird.
Potassium Bromide	... ...	40 grains ,,
Distilled Water ..	... ...	80 ounces, fluid.

2.

Ferrous Sulphate ...	... . .	6 ounces avoird.
Distilled Water ...	... ...	18 ,, fluid.
Sulphuric Acid ...	... ...	14 minims.

Should No. 2, after keeping, change to a brown colour, discard and mix afresh.

7 parts of No. 1 to 1 part of No. 2.

Mawson and Swan's Bromide Paper Developer.

A

Proto-sulphate of Iron	... ...	5 ounces.
Sulphuric Acid ..,	... ...	14 minims.
Water	... ...	18 ounces fluid.

B

Neutral Oxalate of Potash	...	20 ounces avoird.
Bromide of Potassium	... ...	40 grains.
Water	... ...	80 ounces fluid.

When required for use, pour four parts of **B** into 1 part of **A**.

Beach's Potash Developer.

A

Sulphite of Soda (pure)	... ...	2 ounces.
Distilled Water ...	... ...	2 fluid ounces.
Sulphurous Acid ...	... ...	2 ,,
Pyrogallic Acid ...	... ...	½ ounce.

B

Carbonate of Potash (pure) ...	3 ounces.
Sulphite of Soda	2 ,,
Distilled Water	7 fluid ounces.

For a normal exposure, mix **A** and **B** in equal proportions; for under exposure, use more of **B**, for over exposure more of **A**.

The Soda Developer.

A

Sulphite of Soda (pure)	3 ounces.
Distilled Water to make	9 fluid ounces.
Pyro	1 ounce.

B

Carbonate of Soda (pure, Xyst.) ...	6 ounces.
Distilled Water	20 fluid ounces.

Mix one part each of **A** and **B** with 6 parts of water. If the image appears too rapidly add a few drops of a 60 grain solution of bromide of potassium. In case of under exposure add more of **B**.

INDEX.

Acetic Acid.

Acetate of Lead.

Acetate of Soda.

Acetate of Soda.

Albumen.

Alcohol.

Alcohol Absolute.

Acetic Acid.

Acetate of Lead.

Acetate of Soda.

Acetate of Soda.

Albumen.

Alcohol.

Alcohol Absolute.

Alum.

Alum.

Ammonia.

Ammonia.

Ammonia-Sulphate of Iron.

Ammonium Hydrate °880.

Ammonium
Hydrate °880.

Asphaltum.

Aurine.

Benzole.

Bicarbonate of Soda.

Bichloride of Mercury.

Ammonium
Hydrate &c.

Asphaltum.

Aurine.

Benzole.

Bicarbonate of Soda.

Bichloride of Mercury

Bichloride of Mercury.

Bichloride of Platinum.

Bichromate of Ammonia.

Bichromate of Potash.

Binoxide of Manganese.

Borax.

Bromine.

Bromide of Ammonium.

Bromide of Ammonium.

Bromide of Cadmium.

Bromide of Calcium.

Bromide of Potassium.

Bromide of Zinc.

Bromine.

Bromide of Ammonium.

Bromide of Ammonium.

Bromide of Cadmium.

Bromide of Calcium.

Bromide of Potassium.

Bromide of Zinc.

Camphor.

Canada Balsam.

Carbonate of Ammonia.

Carbonate of Soda.

Carbonate of Potash.

Castor Oil.

Charcoal.

Chloride of Ammonium.

Chloride of Barium.

Chloride of Copper.

Chloride of Gold.

Chloride of Gold.

Chloride of Lime.

Chloride of Silver.

Chloride of Ammonium.

Chloride of Barium.

Chloride of Copper.

Chloride of Gold.

Chloride of Gold.

Chloride of Lime.

Chloride of Silver.

Chloride of Sodium.

Chloride of Zinc.

Chloroform.

Chrome Alum.

Citric Acid.

Citric Acid.

Collodion.

Chloride of Sodium.

Chloride of Zinc.

Chloroform.

Chrome Alum.

Citric Acid.

Citric Acid.

Collodion.

Collodion.

Cyanide of Potassium.

Developing Solution.

Dextrine.

Distilled Water.

Distilled Water.

Eosine.

Collodion.

Cyanide of Potassium.

Developing Solution.

Dextrine.

Distilled Water.

Distilled Water.

Eosine.

Ether.

Ferric Chloride.

Ferrous Oxalate.

French Chalk.

Fixing Solution.

Formic Acid.

Gallic Acid.

Ether.

Ferric Chloride.

Ferrous Oxalate.

French Chalk.

Fixing Solution.

Formic Acid.

Gallic Acid.

Gelatine.

Glacial Acetic Acid.

Glycerine.

Gum Arabic.

Hydrochloric Acid.

Hydrokinone.

Hydrosulphate
of Ammonia.

Gelatine.

Glacial Acetic Acid.

Glycerine.

Gum Arabic.

Hydrochloric Acid.

Hydrokinone.

Hydrosulphate
of Ammonia.

Hyposulphite of Soda.

Hyposulphite of Soda.

Iodide of Ammonium.

Iodide of Cadmium.

Iodide of Calcium.

Iodide of Potassium.

Iodide of Silver.

Hyposulphite of Soda.

Hyposulphite of Soda.

Iodide of Ammonium.

Iodide of Cadmium.

Iodide of Calcium.

Iodide of Potassium.

Iodide of Silver.

Iodide of Zinc.

Iodine.

Kaolin.

Litmus.

Magnesium.

Metabisulphite
of Potass.

Methylated Ether.

Iodide of Zinc.

Iodine.

Kaolin.

Litmus.

Magnesium.

Metabisulphite
of Potass.

Methylated Ether.

Methylated Spirit.

Methylated Spirit.

Negative Silver Bath.

Neutral Oxalate
of Potash.

Neutral Oxalate
of Potash.

Nitrate of Baryta.

Methylated Spirit.

Methylated Spirit.

Negative Silver Bath.

Neutral Oxalate
of Potash.

Neutral Oxalate
of Potash.

Nitrate of Baryta.

Nitrate of Potash.

Nitrate of Silver.

Nitrate of Silver.

Nitrate of Silver.

Nitrate of Uranium.

Nitric Acid.

Oxalic Acid.

Nitrate of Potash.

Nitrate of Silver.

Nitrate of Silver.

Nitrate of Silver.

Nitrate of Uranium.

Nitric Acid.

Oxalic Acid.

Permanganate
of Potash.

Phosphate of Soda.

Positive Silver Bath.

Printing Silver Bath.

Printing Silver Bath.

Prepared Chalk.

Protosulphate of Iron.

Permanganate
of Potash.

Phosphate of Soda.

Positive Silver Bath.

Printing Silver Bath.

Printing Silver Bath.

Prepared Chalk.

Protosulphate of Iron.

Protosulphate of Iron.

Pyrogallic Acid.

Pyrogallic Acid.

Pyroxyline.

Rouge.

Salicylic Acid.

Shellac.

Protosulphate of Iron.

Pyrogallic Acid.

Pyrogallic Acid.

Pyroxyline.

Rouge.

Salicylic Acid.

Shellac.

Starch.

Sulphate of Copper.

Sulphide of Potash.

Sulphite of Soda.

Sulphite of Ammonia.

Sulpho-Cyanide
of Ammonia.

Sulphuric Acid.

Starch.

Sulphate of Copper.

Sulphide of Potash.

Sulphite of Soda.

Sulphite of Ammonia.

Sulpho-Cyanide
of Ammonia.

Sulphuric Acid.

Sulphuric Ether.

Sulphurous Acid.

Tannin.

Tartaric Acid.

Toning Solution.

Toning Solution.

Tripoli.

Tungstate of Soda.

Uranium Nitrate.

Varnish.

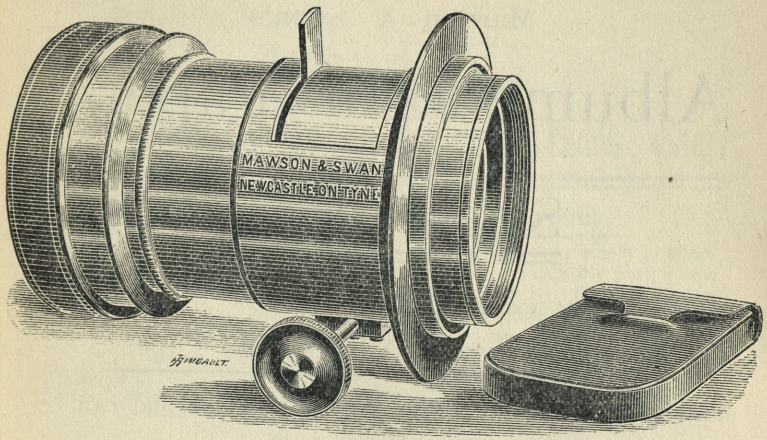
Varnish.

Dry Plate Price List.

	$4\frac{1}{4} \times 3\frac{1}{4}$	5 × 4	$6\frac{1}{2} \times 4\frac{3}{4}$	$7\frac{1}{2} \times 5$	$8\frac{1}{2} \times 6\frac{1}{2}$	12 × 10	15 × 12
The Mawson Plate -	1/6	2/3	3/6	5/-	6/6	16/-	28/-
,, Castle Plate - -	1/-	1/7	2/3	3/5	4/3	10/6	18/-
,, Mawson Lantern Plate - - -	1/9	2/3	3/6	5/-	6/6	16/-	
,, Mawson Photo Mechanical Plate - -	1/9	2/3	3/6	5/-	6/6	16/-	28/-
,, Mawson Opal Plate - - -	3/6	5/-	7/6	9/-	14/-	30/-	50/-

Intermediate and Larger Sizes in proportion.

Illustrated Catalogue 6d.



Photographic Lenses.

Photographers who require a really good and reliable instrument at a low price, may confidently rely upon the various Lenses offered by

Mawson & Swan.

Specimens of work executed by these Lenses can be seen at our Offices and Warehouses.

Mawson & Swan's

Standard Collodions

are the oldest, best known, and most largely used in the world.

In addition to the

Negative and Positive Collodions,

we manufacture special Collodions for

PHOTO-LITHOGRAPHY, COPYING,
TRANSFER, ENAMELLING,
TRANSPARENCIES, &c.

Messrs. W. & D. Downey, 57, Ebury Street, Eaton Square, London, say:—"We have used your Collodion about twenty years for all purposes. All our Portraits of *Her Majesty* and the *Members of the Royal Family* have been taken with it; and though we have tried other Collodions we have never found any equal to yours."

Important.—See that each bottle of Collodion has our label over the cork or stopper.